THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XVII. No. 399—20th YEAR.] LONDON, FEBRUARY 4, 1868. [Subscription per Ann. { 15s. in Advance / 18s. Credit.] DOUBLE No. Price 1s.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis by Dr. FYFE, M.D.:—
9746 cubic feet of gas per ton of coal.
26-candle gas.
13½ cwt. coke per ton of coal.
N.B.—Ramsay's Cannel most resembles the Marquis of Lothian's Cannel, but superior as to coke.
RAMSAY'S PATENT CONDENSED COKE,
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828.
FIRE-BRICK WORKS, established 1804.
FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire Clay.
The Fire Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article.
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Manufactories: DERWENTHAUGH, SWALWELL, and HEBBURN QUAY, Offices: BROAD CHARE, NEWCASTLE-UPON-TYNE. Address, G. H. RAMSAY.

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Patentees of the Standard Gasometers for the Government, and of the
IMPROVED DRY GAS-METERS.
These Meters are warranted to measure correctly and not to vary, and have come into general use more rapidly than any Meters hitherto manufactured.
1862.
CLASSES X. AND XXXI.
CLASS X.—"*For ingenuity, completeness, and efficiency of apparatus used in measuring gas, and for excellence of material and workmanship.*"
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JOSEPH COWEN and CO.,
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The yield per ton is **12,573** cubic feet; illuminating power 33·8 standard candles; coke per ton 1046 lbs.
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ZACH. MELLOR, Town-Clerk.
Rochdale, Jan. 22, 1868.

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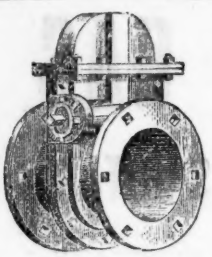

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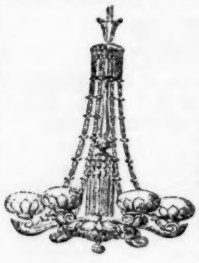

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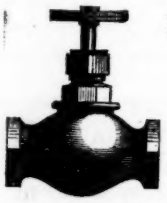

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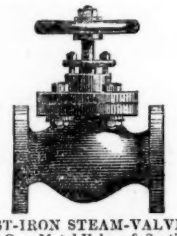
Bore.	Price.
½ inch	£0 4 0
¾ ,,	0 4 6
⅞ ,,	0 6 0
1 ,,	0 8 6
1¼ ,,	0 11 0
1½ ,,	0 14 0
1¾ ,,	0 18 0
2 ,,	1 2 6



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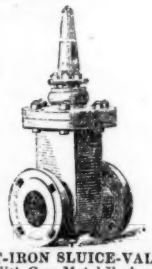
Bore.	Price.
2 inches	£1 2 6
3 ,,	1 17 6
4 ,,	2 15 0
5 ,,	3 15 0
6 ,,	4 17 0
7 ,,	6 0 0
8 ,,	7 5 0
9 ,,	8 15 0
10 ,,	10 10 0
11 ,,	12 5 0
12 ,,	14 0 0



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Bore.	Price.
2 inches	£1 10 0
3 ,,	2 5 0
4 ,,	3 0 0
5 ,,	3 16 0
6 ,,	4 14 0
7 ,,	5 14 0
8 ,,	6 16 0
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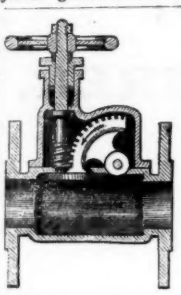

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It will be seen, by reference to the drawing, that by this simple method a clear water-way is obtained, the disc being drawn by the screw or worm entirely out of the way; thus all the advantages of the ordinary sluice-valve are obtained at much less cost, and the liability to set fast and get out of order entirely obviated. They are adapted for all purposes for hot or cold water, and equally suited for high or low pressure; and in case of need of repair, a new valve-seat can be applied without removing the body or case of the valve.

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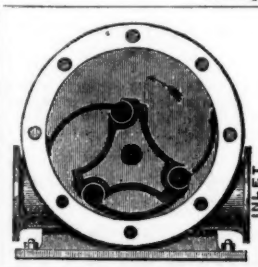

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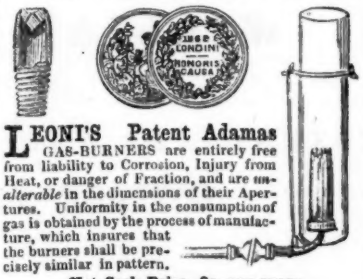

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1867.

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DRY GAS-METER MANUFACTURER,

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HAS BEEN AWARDED THE HIGHEST PRIZE FOR

DRY GAS-METERS,

BY THE IMPERIAL COMMISSIONERS FOR THE

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NOTICES.

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 4, 1868.

Notes upon Passing Events.

COLONEL GREGORY'S address, as President of the Institution of Civil Engineers, is original and in his own style—a precedent set, we believe, by Mr. John Fowler. He treats of subjects of the deepest interest, although certainly not subjects contemplated by the founder of the Institution, who could not foresee that the engineer would be one of the best defenders of nations. The Institution was founded on the 2nd of January, 1818, by six members. Thomas Telford was the first president. It now comprises 1472 members. Colonel Gregory quoted from the minutes a description of a civil engineer by the first president, written in 1827. Civil engineering is "the art of directing the great sources of power "in nature for the use and convenience of man. . . . . "The most important object of civil engineering is to improve "the means of production and of the traffic of states both "for internal and external trade. It is applied to the con- "struction and management of roads, bridges, railroads, "aqueducts, canals, river navigation, docks, and store- "houses, and to the construction of ports, harbours, moles, "breakwaters, and lighthouses, and to the navigation by "artificial power for the purposes of commerce." Telford also refers to the embankments and drains which, in Holland, created a class of hydraulic engineers as distinguished from architects. Colonel Gregory observes, that "eloquent and "comprehensive as the words of Telford were, even his "almost prophetic vision, forty years ago, did not take in "the whole of that field of usefulness now open to us." "Metallurgy has worked out a revolution in the treatment "and application of metals; chemistry has pointed to purifi- "cation and utilization of the sewage of towns, and the "relieving rivers of pollution; hydraulics have led to projects "for supplying cities with waters from remote mountains; "electricity speeds the 'winged word' in a girdle round the "world more quickly than fairy magic in the dream of poets." After referring to recent works of engineers in Europe, the new president mentions that Victoria, founded in 1842, which, with an annual revenue of about three millions, spends about £300,000 in roads, bridges, and public works; Ceylon spends £230,000; Mauritius about £70,000, and the Cape about £50,000. Colonel Gregory justly observes that the errors in British railway enterprise arise chiefly from unprofitable works forced on companies by public opinion, and from competition sanctioned by Parliament—useful for traffic and costly to shareholders. In about forty years 400 millions have been expended on railways, with a saving to the public estimated at 15 per cent. on the outlay; but this estimate is imaginary, because by railways only could so many passengers and so much merchandise have been carried. On this point Colonel Gregory did not dilate so fully and so forcibly as he might. Within the last few days the Underground Railway has opened an extension to communicate with the Midland—a work which, if dependent on Government funds and Government sanction, would have been impossible. In Paris, the Emperor is most anxious to complete a system of underground railway communication, but the enterprise and the funds are alike wanting. But Colonel Gregory hastened on to the military—the most important part of his address. He commenced by referring to the paper read on the 25th of November, 1851, by Colonel Colt, of the United States, and an associate member of the Institution, on the application of machinery to the manufacture of rotating fire-arms. The paper claimed for the machinery used the advantage of cheap production of the weapons in large quantities, and in such uniformity in the various parts, that "when a new piece is required, a duplicate can be "supplied with great accuracy. . . . While in active ser- "vice a number of complete arms may be readily made up from "portions of broken ones." In the discussion which followed the reading of this paper, an incident occurred to which the decorous chroniclers of the Institution are not likely to refer—least of all a President. The late Mr. Charles May, who was a quaker, took up one of the revolvers lying on the table, and

said: "I can say nothing about this thing as a weapon of war, "having nothing to do with war; but as a mechanic I beg to "observe that it is a wretched production, without fit or "finish!" He then entered into detailed criticisms with his usual acuteness, very much to the discomfiture of parties present interested in the speculation of selling the Colt patents. These defects have since been remedied. American ingenuity seems equal to every mechanical emergency; still it is not a little curious that almost the only practical remarks on a revolving pistol, made that evening came from one of the Society of Friends. Mr. Charles Manby had the merit of establishing the first factory for the construction of arms on the Colt principle, in 1852; but it was not until 1854 that the Government, under the pressure of the Crimean war, adopted the plans of Mr. John Anderson, an engineer trained to private enterprise, backed by the recommendation of a select committee of the House of Commons, and established the small arm factory at Enfield. This new factory was furnished with machinery copied from that already in use in the United States arsenals at Springfield and Harper's Ferry. "The machines used "at Enfield are, to a great extent, varieties of copying "machines, in which a standard model is reproduced by a "revolving cutter in wood or metal, as the case may require. "Finally, the finished parts—stock, lock, barrel, bands, "bayonet, plates, screws—find their way in numbers to an "assembler, who, furnished with a screwdriver and a chisel, "takes up the parts indiscriminately, and puts them together. "So entirely interchangeable are the parts found to be, that a "payment of 3·29d. for each rifle put together gives the "workmen wages of about 50s. per week. . . . Any "damaged part in a rifle in use can be replaced by a corre-"sponding part without any fitting." This is one of the few instances in which a Government manufactory is desirable and justifiable. In the great war with Napoleon we were almost entirely dependent on the Birmingham district for fire-arms. It was at that time the great trade of the town. But a long peace turned the capital of Birmingham in many other directions. The issue of a contract for fire-arms was the signal for a strike amongst some one of the many classes of workmen employed in the manufacture of military small arms. No government that believes war possible can afford to be dependent on the freaks and fancies of trades unions. Besides, when the Enfield factory was established no company could have foreseen a steady demand to justify a large outlay of capital in machinery. Under the pressure of competition a Birmingham small arms company has been formed, which has made interchangeable short rifles for the Turkish Government. It is said that the Government rifles cost £2 14s. each, not allowing anything for profit or interest on capital. "The old smooth-bore musket was con-"sidered to make good practice if, at 100 yards, 75 shots in "100 hit a target 6 feet square. With the present service-"rifle and ammunition 100 shots can, at the same range, be "placed in a space of 6 inches. From January, 1857, to "December, 1867, 616,000 new arms were made at Enfield, "and 175,550 converted to breech-loaders on Snider's plan. "The cost of converting to the Snider breech-loader is said to "be about 16s. 3d. per rifle. The present machinery at "Enfield is capable of turning out about 130,000 arms "annually." The dignity of President would not allow Colonel Gregory to be amusing, otherwise he could have related a few of the absurd propositions submitted to the Ordnance Select Committee by amateur inventors in the art of destruction. One clergyman suggested a gigantic razor to be fired by electricity from two guns simultaneously, so as to mow down a whole regiment at once, and to escape the crime of maiming without killing outright he proposed anointing the razor with some poisonous unguent! The president next referred to the origin and use of iron-cased floating batteries, the suggestion of the Emperor of the French, and to the labours of the special committee appointed in 1860 of military men, to whom were added Dr. Percy, an eminent chemist, and two scientific engineers, members of the Institution, Dr. Fairbairn and Dr. Pole, to investigate every fact connected with the use of iron in defence. This committee was dissolved in 1864, having produced four large volumes of reports and proceedings not as yet published. Colonel Gregory reminded Dr. Pole that he had not yet given the Institution a summary of the contents of these volumes, for which he had obtained the special permission of the Government. The progress of manufacture under demand may be judged from the fact that "some of the "principal English manufacturers now offer to roll plates about "20 feet long, 6 feet wide, and 15 inches thick." The progress in the construction of ordnance was next briefly related, with reference to the improvements so largely due to Sir William Armstrong and to Mr. Whitworth. Breech-loading has been, after full experience, abandoned for heavy guns. The advantage was not sufficient to compensate for the complication involved in field or fortress operations. On board ship, especially in broadside guns, breech-loading is a great advantage. In the hurry of action it is not uncommon for part of the crew engaged on muzzle-loaders to be sent overboard in running back the gun; but Colonel Gregory does not say a word about this "detail." The heaviest projectile thrown by any gun in the service prior to 1854 was the 200 lb. shell of the 13-inch mortar. "The largest Armstrong gun hitherto constructed "is an experimental one, which has a calibre of 13·1 inches, "weighs 23 tons, and throws a shell of 600 lbs." Two guns of Mr. Whitworth's, of 9-inch calibre, and weighing 15 tons, are about to be delivered for trial. "Prior to the mechanical "improvements which have led up to the present rifled guns, "the greatest distance to which a projectile was ever thrown "from a smooth bore was not much over 6000 yards, and the "limit of bombarding at high elevations with a 13-inch mortar "was 4500 yards. With modern ordnance projectiles have "been thrown with greater precision 10,000 yards, and the "guns of service make better practice at 6000 yards than was "formerly attainable at 3000 yards. . . . The rifled gun is "in one case more than eleven times and in the other more "than thirteen times as accurate as the smooth bore." Colonel Gregory believes that neither France, Prussia, nor the United States has attained the certainty, the economy, or the perfection of British factories in the production of heavy ordnance. "But until smooth bores are much more largely re-"placed by rifled guns for all practical purposes, we are "almost unarmed in many of our so-called defences at home "and abroad." In reference to naval construction, we are sorry not to find in the president's address some reference to the comparative value of the turret and broadside principles. It seems that "our navy now possesses 31 ironclad ships, and "eight more on the stocks, four of the existing ships being fur-"nished with turrets, which are also to be supplied to two of "the new ones." But "many of these ships are of doubtful "strength, and you will probably be surprised to hear that "the sum devoted to the construction of new ironclad ships "for the current year does not reach £900,000, or less than "one-twelfth of the vote for the navy—barely sufficient to "build three ironclad frigates. . . . *If an ironclad fleet be "necessary, surely this fact merits the gravest consideration.*" In reference to railways as a means of national defence, Colonel Gregory takes exception to Lieutenant Hozier's opinion, expressed in his "History of the Seven Weeks War," that not more than 10,000 men, equipped for the field, can be moved in one day. On the other side, he quotes from the report of General Parsons, chief of rail and river transportation for the United States, that "it is now practicable, on 24 hours notice, "to embark by railway at Boston or Baltimore a larger army "than that with which Napoleon won his most decisive vic-"tories, and landing it within three days at Cario, 1200 miles "distant, and there embark it on transports, and within four "days more time disembark it at New Orleans, 1000 further." The railway construction corps formed during the late war became very expert in the work of repairing damage. The Rappahannock River Bridge, 625 feet long and 35 feet high, was rebuilt in nineteen working hours. Colonel Gregory observes, with authority, on the defensive power we possess in our railway system and the *men* connected with it:—"In 1860 "Mr. Charles Manby suggested to the late Lord Herbert the "formation of a volunteer corps composed of the members of "the Institution, but it was not until 1865 that the Engineer "and Railway Volunteer Staff Corps," of which the president is one of the colonels, was formed "for directing the applica-"tion of skilled labour and of railway transport to the pur-"poses of national defence, and for preparing, in time of "peace, a system on which such duties should be conducted." This corps consists of officers only, who must be contractors or railway officers. Its duties comprise the preparation, for the use of Government, of reports on the railway transport of troops and their supplies, on the destruction and construction of railways, the improvement of natural obstacles, and the making of artificial ones to impede the landing or advance of an invading force, and on topographical particulars connected with these subjects. These reports are confidential; but the

president considered himself in a position to say that "the "calculations which have been made by some of the most "experienced railway managers show the completeness and "the resources of our railway system would enable the "whole regular and irregular forces of the country to be "moved in any required lines of defence within a few days."

Dr. Vacher, the editor of the Paris *Gazette Médicale*, has published what seems to be an amusing pamphlet on the food supplies of the principal cities of Europe, including London. On the consumption of Paris, in consequence of the minute system of licence-inspection and taxation, he can speak with some degree of confidence, and perhaps also of other continental cities, but, like almost all Frenchmen, the moment his pen touches England he talks nonsense. In a translation for French use of Mrs. Barbauld's infant stories, made about forty years ago, England is described as a cold, foggy country, producing neither fruit nor wine, and with nothing good except penknives, potatoes, and beer. In forty years French popular writers have not advanced much in knowledge on practical subjects. What would be thought of a contributor to one of our leading journals describing the French as a thin people living chiefly on frogs? That was the firm belief of our mobs and country gentlemen in the time of Hogarth, but the multiplication of travellers and newspapers has taught us better what "foreigners" are like and how they live. Dr. Vacher calculates that the consumption of meat in London is as 109 to 78 in Paris, and also that we consume five times as much fish. He puts the consumption of Vienna at 87, of Berlin at 53, and of Turin at 24. Now, there is positively no means of calculating the consumption of meat and fish in London. A special inquiry might ascertain what cattle and meat came in, but to discover what goes out from the central markets to the rest of England would be beyond the powers of a private inquiry. It is probable that we eat more meat in London than in Paris, where a very much larger quantity of bread, and of soup made of uneatable meat and bones seasoned in with vegetables, butter, milk, and flour, is consumed. Fish, except fresh-water *friture*, is a luxury in Paris; in London it is the food of the very poorest. The moment that the worthy Dr. Vacher begins to reason and dilate on English habits and tastes he displays characteristic ignorance. He talks of rumpsteaks—one of the most expensive of dishes—as a national institution, evidently not knowing that mutton forms a very much larger per centage of the meat consumed in this country than beef. We are rather a mutton-chop—not a "mutton-cutlet"—eating race than a beef-eating race, and so we have been for at least the last forty years. The excess of consumption of meat in London over Paris is caused most by the taste of the multitude for plain roast, baked, broiled, or boiled, in preference to a more complicated meal. When a French carpenter begins the day he takes a cup of something that pretends to be coffee. At his breakfast, which would be our English carpenter's dinner, he eats a yard of bread and begins with a pint and a half of soup, which enables him to be satisfied with a small piece of beef boiled to rags, and a small slice of roast, or a dish of ragout, followed by a little fruit, if cheap enough, a slice of cheese, and, if times are very prosperous, a cup of coffee. It is, in fact, a dinner. His dinner, in the same way, is largely composed of bread, soup, and vegetables, dressed with butter or sauce. The English carpenter breakfasts much more slightly on tea, coffee, or cocoa, with cold meat or hot bacon; and dines on meat and potatoes, with a very little bread and cheese, in the middle of the day, when the Frenchman is at breakfast. If he can afford it, the English carpenter will have at supper hot meat. But where, unless in the servants hall of a Dorsetshire squire, does Dr. Vacher find the Englishman who breakfasts, *lunche*, dines, sups, and takes tea and cakes? He is evidently not aware that breakfast represents the French cup of coffee on rising, that lunch represents the *déjeûner à la fourchette*, and that those who thus lunch dine late and do not sup. Mr. John Lemoine, who ought to know better, remarks on the enormous appetites displayed by young English girls at pastry-cooks shops in Paris, forgetting, or not knowing, that these girls have not had a French breakfast of oysters, cutlets, larks, kidneys, cheese, and sweets, washed down with half a bottle of good wine and water, and that they have probably walked ten miles sight-seeing. Dr. Vacher considers that the inspection of food is not sufficiently minute in Paris. He once cut into a leg of mutton and found an abscess in the middle. What inspector could look into the centre of a leg of mutton? This is the usual cry of a certain class of sanitary doctors who would like to inspect every butcher's shop. Inspection of markets ought to be sufficient, if markets are spacious; but, in Paris, the style of cookery lends itself to concealing in sauce, faults of meat. The doctor is in favour of eating horseflesh. Why horseflesh should be encouraged by lower taxation, in preference to beef and mutton, we cannot understand. In Germany, where people eat raw pork in the form of sausages, horrible diseases have been communicated to human beings. We did not know that the pork worm had travelled to Paris. The good doctor laments that the pork sold in Paris is not, as in Berlin, subjected to microscopic investigation. The French Government, fond as it is of meddling, in this instance saw how impossible it was to carry out the suggestions of learned Academicians. We have always understood that the safe way to kill *entozoa* in pork is to cook it well.

The Food Committee of the Society of Arts are continuing their investigations, and will produce at their close a volume of evidence both interesting and useful. The other day they had Mr. Charles, the celebrated fishmonger, of Pimlico, before them. Mr. Charles is a representative men of his trade. He is not only a smart man of business but he can talk well. His evidence rather modifies our views about the situation of Billingsgate. He staunchly advocates retaining the market on the river, so as not to be entirely dependent on the rail, and he gives some reasons, not entirely conclusive, for concentrating all the trade in one market. His plan for relieving the present crowded condition of the fish-market is to raise another storey on the Billingsgate Market, to which the packages of fish should be raised by lifts. There would still be the disadvantage of the inconvenient access to Lower Thames Street through narrow lanes. If any public improvement should require the destruction of the present Billingsgate Market, it is a question whether it might not be advantageously transferred to a site on the vast open space created at Hungerford Stairs by the Thames Embankment. Mr. Charles declares, and he ought to be an authority, that the statements that fish are destroyed at Billingsgate to keep up the price are idle tales, without any foundation. He asks, very fairly, who would destroy his own property in order to raise the value of what might fall into some one else's hands? He also says that, as far as he is concerned, there is no fish wasted, for, after supplying his customers, he sells at night whatever is not likely to keep to poor people who assemble at his shop for the purpose. He divides fish into first class, which includes salmon and turbot, second class, and rough fish, which last includes, we suppose, herrings, sprats, and flounders. Mr. Charles is the inventor of the contracts for supplying fish daily at sixpence a head; it is presumed he gives second-class fish to such customers. It is, however, not a bad arrangement for either party. Railways have not proved an unmixed advantage to the fish supply of London. They bring fish from every British and some north of Europe ports, but they distribute over the Continent excellent Dutch catches, which formerly had only a market in the Thames. Paris draws largely on the London market for fish supply, and gets, as is worth noting, a great deal of very bad fish, including unseasonable salmon. Mr. James Greenwood, a member of the committee—and we presume the celebrated "casual pauper," gave useful evidence on the costermonger's trade, to the value of which we have on a previous occasion adverted. In Whitecross Street he found 55 stalls for the sale of fish, wet and dry, and nine stalls for the sale of Ostend rabbits, at one penny to three halfpence less than the price at the shops. These Ostend rabbits, imported by the ton, are a very important addition to the supply of cheap meat, and make horseflesh less necessary. Mr. Greenwood counted 1300 persons carrying market-baskets coming out of the street between eight and nine o'clock. There is a large trade in plaice, sent in "trunks"—boxes holding a hundredweight—instead of baskets, as formerly. Whenever there is a glut of fish the costers rush in, buy, and distribute all. Mr. Greenwood saw tons of meat that made him "shudder to contemplate," and wonder where the inspectors draw the line. The meat on the costers barrows was better than that in the shops. He says the meat was fresh, but poor in quality—probably inferior merino mutton. The question was discussed as to whether a costermongers market could be provided, but Mr. Greenwood observed that poor people believe in the "barrow "man." Regulate and tax him, and he is no longer the house-to-house "pedlar of food." Potatoes are another article

sold cheap at stalls and on barrows. In Newgate Market, at night, he found meat very nasty and very cheap on Saturday. The people who buy meat in Newgate Market at 3½d. a pound would not look at the same quality in a butcher's shop in their own neighbourhood. Mr. Greenwood considers the costermonger system rotten at heart, because it is identical with depravity and ignorance; and, in support of this opinion, he says, "It is the ordinary pastime of this class of men to "spend the whole of Monday tossing for money, and other "kinds of gambling." We cannot quite follow this very able writer here. These costers do what neither markets nor shopkeepers can for the poorer classes, and they invest in and distribute cheap food; probably the spirit of enterprise which leads them to speculate in fruit or fish also leads them to gamble. But are there not in every class a per centage of gamblers? What fills Tattersall's subscription rooms? Sir William Bodkin observed that he had found costermongers, as a class, honest, industrious, and kind to their donkeys. It seems that the abolition of Stratton Ground as a costermongers market has raised the price of fish in Westminster. Mr. Greenwood's final opinion was that if you educated the man you would spoil the costermonger. He and other true philanthropists seem to lose sight of the fact that there are always in civilized society a per centage of Bohemians, who prefer liberty with some drawbacks, to respectability with even the regulation of clean hands and face. Grooms constantly give up good places, with good wages, board, and clothes, to travel with a circus at eighteen shillings a week.

The Tunbridge Wells sewage disposal debates reached another stage on Thursday, Jan. 23, when Mr. Arnold Taylor, the inspector appointed by the Home Secretary, held a court of inquiry into the merits of Mr. Lawson's plans, and incidentally into the foundation of Mr. Julian Goldsmid's opposition. Who is Mr. Arnold Taylor? He must be a very able man if he can make much of such conflicting evidence of facts and of opinions as that brought before him.

> Who shall decide when doctors disagree,
> And soundest casuists doubt like you and me—

especially when the doubts and disagreements extend over 13 columns of our smallest type. The odds—very long—are in favour of Mr. Lawson's plan being adopted with certain modifications, showing the superior ability of the inspector—because, if he is not the rose, he has dwelt near the rose; and besides, no one else has a definite scheme. To say what the unhappy Tunbridge people had better do is very difficult, but the general bearing of the evidence seems to point to incalculable expense, and an unlimited nuisance to be created in return for the capital sunk on the advice of Mr. Rawlinson's late assistant. There are to be two sewage farms—one in a northern and one in a southern valley—to cost about £62,000, with £8000 added for the necessary town works. But then, there is nothing allowed for compensation and the extra work which always attends such undertakings. The stinks will create large claims for compensation, even if the scheme answers. No really "eminent engineer" approves the scheme. The opposition had one strong point in the fact that in Mr. Lawson's original report he treated the northern valley as unsuitable for irrigation. On pressure, he arranged to take what he at first condemned. The opposition, with some show of reason, say that his first opinion was right, and his second a concession unworthy of an engineer with an opinion of his own. The weak points of Mr. Lawson's scheme are that he proposes to irrigate steep land quite unfit for sewage cultivation, that he makes use of land likely to be valuable for building purposes, and that he brings a nuisance, or what is likely to be a nuisance, alongside valuable residential property. All these defects may be inevitable to any scheme of sewage irrigation near Tunbridge Wells; but that remains to be proved. So far we adhere to the opinion we have already expressed, that before embarking in such a "Dead Sea" of sewage, some scheme of deodorization, and perhaps a partial adoption of the earth-closet system, in certain situations, ought to be carefully considered and reported on. Mr. Lawson's authority is weakened by his arguments and illustrations. He quotes the Mansfield water meadows as an instance of what may be done with sewage. Nothing can be more ridiculous. He might as well quote Malvern as a model for the imitation of the City of London. The sewage of Mansfield is so weak that the meadows owe more to the water than the manure. It is a toy place altogether. Has Mr. Lawson ever seen it? Probably not; but then it is one of the stock samples of sewage farming quoted in the first Blue-Book of the old Board of Health. If an irrigation scheme is to be carried out successfully, the stuff must be carried to a situation where in the process it will not be a nuisance, for there must be a smell at times; and it must be laid on land neither too steep nor absolutely flat, where it can slowly percolate until it is lost or purified. As for Mr. Goldsmid, he is a very young man, and is very rich. If he thinks that rich men can afford to despise public opinion, and insist on their absolute legal rights in defiance of the wishes and interests of their neighbours, he will find himself mistaken. It is possible to be an Ishmael in a crowded city. Finally, our general impression is that Mr. Lawson is not quite strong enough for his place.

Circular to Gas Companies.

We have frequently commented on the progress of the agitation for cheap gas in the metropolis, and on the action of the Legislature to amend the conditions of gas supply in London; but occasional notices of the different phases of the question, as they present themselves from time to time, are too often only momentary in their impressions, and we are glad to perceive that the whole subject has been considered in an able and comprehensive manner in a small publication, just issued from the press, by "A Director of the Imperial Gas Com-"pany." The title of this publication is "The London Gas "Companies and the Legislature in 1867." It commences by noticing generally the conduct of the Legislature in dealing with the metropolitan gas companies from their first establishment, and then considers more particularly the Metropolis Gas Act of 1860; the origin of the present agitation; the Government Gas Bill of last year, with the report of the select committee; the proposed amalgamation of the companies; and the settlement of the question at issue. These and several correlative matters are considered with the view of showing the injustice of the treatment of the metropolis gas companies by the Legislature ever since the commencement of gas lighting, which, it is observed, may serve as a warning to all persons how they invest their money in undertakings dependent on parliamentary sanction for their existence and remuneration. The policy of Parliament with regard to those companies is thus comprehensively, and somewhat bitterly, sketched in the first page:—

> The policy of Parliament in reference to these companies has hitherto been, first of all, to encourage their establishment so long as they were attended with risk and uncertain of success, by inducing the investment of capital in them without limit as to profit, and so long as they remained unsuccessful to leave them alone to struggle on as best they could; then, so soon as the realization of profit became probable, to encourage the useless expenditure of fresh capital in the establishment of competition between them; then, to put a limit to the dividends of the companies, and to declare that the public alone should benefit by the realization of any profit beyond that limit; and finally, now that the companies have attained that limit, it is endeavoured to compel them so to reduce their charges, as to render the realization of their authorized dividends an impossibility.

In considering the various branches of the subject, the principal object of the writer is to substantiate the foregoing charges against Parliament, and it must be admitted that he advances many strong instances in support of them. At the present time, it is observed, the attack is principally directed against the metropolitan gas companies, but, if successful, it would at any time afford a precedent for similar attacks on all other descriptions of property invested on the faith of Acts of Parliament, and would lead to the general confiscation of such property. In tracing the history of metropolitan gas legislation from the year 1822, when it was determined, on the advice of Sir W. Congreve, that only one company should be allowed in any district of the metropolis, it is shown how readily that principle was departed from when the practicability of lighting by gas was satisfactorily established; and a system of competition was then introduced, which produced great waste of capital, and became as prejudicial ultimately to the consumers of gas as to the companies. As soon also as it was found that profits might be realized from gas undertakings the Legislature passed the Act of 1847, by which their profits were limited to 10 per cent. The utter inexpediency of the system of competition induced the gas companies generally to adopt, in 1857, the principle of districting recommended by Sir W. Congreve. The adoption of that principle, however, raised an outcry against the virtual monopoly, which gave rise to the Parliamentary inquiry that culminated in the passing of the Metropolis Gas Act. The "Director" combats with much force the

assertions of the agitators for cheap gas—reiterated in the report of the committee of last session—that that Act is unduly favourable to the gas companies; and he shows that, with the exception of sanctioning the system of districting, the Act contained only restrictions of the rights and privileges which the gas companies had previously enjoyed, and imposed new and onerous obligations on them in the exclusive interest of the public, including, among other restrictions and obligations, the limitation of the payment of back dividends to six years, and the compulsory supply of gas. That Act, it is said, was believed to have established a contract between the gas companies and the public, that so long as they fulfilled the obligations imposed on them they were entitled to reap the advantages it professed to secure them; but that "now it is sought "to alter the provisions of the Act to the prejudice of the "companies, not because they have in any respect failed to "perform their part of the contract which it established, but "simply because they have been so fortunate as to attain to "the limited dividend which it authorized them to declare, and "in the hope and expectation of obtaining which hundreds of "persons of limited incomes have invested their earnings." The origin of the present agitation is traced to the raising of the price of gas in the City by the Great Central Consumers Company, to have their revenge on which company—their own offspring—the Corporation determined, in 1866, to embark the corporate funds in a gas speculation, to compete with the existing companies. The Bill introduced with that object, it is observed, was rejected by the committee without calling for evidence to rebut that by which it was attempted to be established, the gas companies having volunteered to supply gas equal to 14 candles at a maximum price of 4s. per 1000 feet. The "requirements of the Metropolitan Board of Works and of the Corporation of London" are next considered, including the reduction of price to 3s. 6d. per 1000 feet, and the increase of the illuminating power to 18 candles, and the fallacy of the assertions on which those demands were founded is exposed. It is observed:—

The companies met them by the simple statement, that their capitals had been subscribed on the faith of Acts of Parliament under conditions with which they had fairly complied, and of which the public had had the full benefit; that it would be most unfair to those who had invested their money on the faith of those Acts that their provisions should now be altered to their prejudice, and that the requirements of the Board of Works and the Corporation of London would practically involve them in little short of ruin.

To illustrate this, they pointed out that by the sale of 12-candle gas at a price of 4s. per 1000 feet, some of the London gas companies failed to maintain their authorized dividends, and that the recent rise in the price of labour and materials would render it still more difficult to maintain them for the future; whilst the increase of illuminating power required of them would of necessity largely increase the cost of manufacture by the necessary employment of cannel coal, the supply of which was very limited in extent, and yearly increasing in price.

The "Director" shows that, while the Government were required by those bodies to compel the companies to reduce their price by 6d. per 1000 feet, they were at the same time requiring that they should supply gas of an increased value equal to 1s. 6d., so as practically to reduce their charge to the extent of 2s. per 1000 feet, though the present price is inadequate to maintain their authorized dividends. The Government Bill of last year, and the circumstances under which it was read a second time, are only briefly alluded to; but a review of the report of the committee occupies several pages, the averments adverse to the gas companies and the impracticability of some of the recommendations being satisfactorily answered and severely animadverted on. The threat of competition embodied in the committee's report especially excites the wrath of the "Director," and is frequently referred to. In the section of his pamphlet on the "probable effect of the committee's recommendations if adopted," he thus reverts to the threat:—

For my own part I confess, that however formidable this threat may appear at first sight, and was no doubt intended to be, it loses much of its terrors on calm investigation, for it is one to which I cannot but think that the Legislature would never give its sanction, either on the score of justice or expediency, nor, if it did so, that it ever would be acted on.

As regards its gross injustice to the companies, it is so manifest, that it hardly requires to be commented on, nor, in the whole history of legislation, could any precedent be found for such a course as that recommended. Wherever a similar attempt has been made it has invariably failed, and whenever public bodies have been authorized to supply either water or gas at the risk of the ratepayers, they have been compelled, without any exception, to buy up the interests on a fair principle of compensation of any companies with whom they would otherwise have entered into competition.

Assuming, however, that that recommendation were adopted, let us see to what it would lead. It would involve the expenditure of several millions of capital to be raised on the security of the parochial rates, and the breaking up of the thoroughfares of London from one end to the other, for the ostensible purpose of cheapening to a limited extent, the present price of gas, and would thereby render abortive an already incurred expenditure of six millions and upwards, to the ruin of the shareholders who have invested their money in the present gas undertakings, under conditions with which they have faithfully complied, and to the annihilation of the security which these undertakings at present afford for a vast sum of money lent upon them at limited rates of interest by trustees and others.

To obviate this annual loss, the public bodies would no doubt ultimately be induced, after all the outlay they had incurred in erecting works of their own, to buy up those of their competitors at a somewhat depreciated value, which, if they had purchased in the first instance at their fair value, would have saved them the millions which they would have uselessly expended in the construction of their own works.

It is further very truly remarked, that if the companies were subjected to competition they should in justice be relieved from the obligations of the Metropolis Gas Act, which were imposed as conditions of the privilege of monopoly, and in that case many parts of London would remain unlighted, for "it would "be too monstrously unjust, after compelling the companies "under heavy penalties to supply gas throughout the whole of "the districts confided to them to all persons requiring it, and "at a less charge than they were previously authorized to de-"mand, under the plea of its sufficiency under a system of "monopoly, to subject them to a ruinous competition, and still "to compel them to go on supplying it at the same charge" in parts of the district where the supply is unprofitable. The effect of the proposals of the committee for fixing the price and illuminating power, if carried into operation, would, it is contended, be to reduce the dividends of the companies one-half, under the most favourable circumstances, and in considering the proposal of amalgamation it is observed, that one effect of it as regards the public would be the establishment of a monopoly in the sale of coke and other residual products. The proposed abolition of the reserve-fund, it is also contended, would operate injuriously on the public as well as on the gas companies, for if the latter had not such a fund to have recourse to for making up their authorized dividends, they would not have risked making their reductions in the price of gas which have temporarily prevented them from maintaining the authorized dividends out of the profits of the current year. The case of the Imperial Gas Company, as might be expected, is feelingly represented by the "Director," who adverts in a forcible manner to the injustice of compelling that company to supply gas, and yet refusing to grant them the money or the land requisite to enable them to do so. It is not to the interest of the proprietors of the Imperial Company, it is stated, to increase their supply of gas, and they would prefer to remain as they are, but they are subject by the Metropolis Gas Act to penalties if they do not supply gas to every part of their district when required, and yet Parliament has refused to grant them the means of complying with the Act. The magnitude of their present operations is sufficiently indicated by the fact that, in a single night during the last winter, the company sent out no less than 16 million cubic feet of gas. In the section of the pamphlet devoted to the exposure of the "injustice to the companies of the committee's "report," it is further remarked that, as they had ceased to compete with each other before the passing of the Metropolis Gas Act, it was not therefore the cause of prosperity to any, and there is no principle of justice on which it can be contended that competition should now be established against them, when not one of them can be charged with the non-fulfilment of their obligations. The proposition to reduce the prices so that the dividends of the companies should in future only approach to 10 per cent. would, if carried into effect, have greatly depreciated the value of the shares of all the companies, and would to that extent amount to a confiscation of the property of the shareholders. In treating the question of amalgamation, a strong opinion is expressed that the cost of manufacture could not, in the case of the Imperial Company, be reduced beyond a very small fraction by their union with any other company, while the extension of the district would probably be attended with a diminution in the efficiency of the management. At all events, it is observed, if amalgamation be determined on—

The only practicable mode of determining the extent to which, and the conditions upon which it should be effected, would be (as it appears to me) by means of a commission composed of competent and experienced persons, who would inspect all the different works, and make themselves thoroughly acquainted with all the matters to which I have before referred, and who might possibly then be able to recommend some fair and practicable scheme for adoption. The same commissioners might also include in their inquiry the question as to the mode of manufacture of gas, with a view to its purity and the avoidance of nuisance, as well as the proper illuminating power to be required for London gas, based on reliable data as to the capacity of the works of the several companies, and the sufficiency of the cannel coal-fields for the supply of an adequate quantity of that description of coal at a moderate price.

We have already occupied so much space with our notice of this very able defence of the metropolitan gas companies, that we can only briefly allude to those portions relating to the consideration of the proposed transfer of the gas-works to public bodies, the contemplated proceedings by the Corporation of London and the Metropolitan Board of Works, compensation to officers, and the settlement of the question at issue, each of which is treated with great ability and full knowledge of the subject. We strongly recommend the pamphlet to our readers, as the best exposition of the case of the metropolitan gas companies that has yet appeared in a comprehensive and compendious form.

It is a favourable symptom of the abatement of gas agitation in the metropolis that the Clerkenwell vestry, at a recent meeting, refused the application of Mr. G. Flintoff for the use of their hall to hold a public meeting on the supply of gas. The inhabitants of Clerkenwell will therefore be deprived of the pleasure of hearing his stentorian eloquence directed against the gas companies, and they will fail to have the advantage, not long since courted by the Court of Common Council, of being edified by that great engineer's theoretical notions about the manufacture of cheap gas. It is to be hoped that such notions are now at a discount.

Two important appeals against the assessment of gas-works have been recently decided by arbitration, the awards on each of which establish a reduction of about one-third on Mr. Castle's valuations for parish authorities. In the first case he had increased the assessment on the works and mains of the Nottingham Gas Company, in the parish of St. Mary, from £2700 to £4286; but the arbitrator, Mr. Serjeant Hayes, reduced it to £3020, each party to pay their own costs, and half the cost of the award. In the second case the Bristol United Gas Company were appellants against an increased assessment by Mr. Castle on their works and mains, in the parish of St. Philip and St. Jacob, from £2600 to £3957. Mr. George Pownall, the eminent surveyor, who was the arbitrator, reduced the amount to £2700, which sum is less than the company were at one time willing to agree to. Mr. Castle and the valuer for the gas company had, indeed, recommended their respective clients to agree to an assessment of £3000, but the Assessment Board would not accept less than £3500, and so the appeal was proceeded with. It is estimated that the costs on both sides for the decision of the two appeals, which have been pending for about two years, will amount to nearly £5000, half of which expenditure in litigation has to be borne by the ratepayers of the two towns respectively, and the other half by the gas consumers. The late Mr. C. Penfold, the inaugurator of the system of rating public companies on their profits, used jocularly to tell his friends that "where there is no hacking there are no chips;" and his successor, Mr. Castle, appears to have adopted the same opinion, and "hacked" until he had collected a plentiful supply of "chips," in the form of bills of costs, more satisfactory, no doubt, to himself than to his clients. We have been favoured with copies of the shorthand-writers notes on the Bristol case, and purpose giving an abstract of the proceedings in any early number.

Register of New Patents.

1303.—Charles Bosch Reitz, of 3, Leadenhall Street, in the City of London, for "*Improvements in meters for measuring the flow of water and other fluids, which improvements are applicable also in the construction of pumps for air, water, and other fluids.*" A communication. Patent dated May 3, 1867.

This invention consists in the employment of a disc or diaphragm of india-rubber or other similar elastic material, fitted within a chamber somewhat resembling in shape a partially flattened sphere. Each such chamber as employed is perforated at its flattened sides with a number of holes, and has also at one of its sides a larger aperture, through which passes a draw-rod. Each such flattened spherical chamber is provided with the elastic disc, as before mentioned: the disc being so placed or disposed as to fit one of the flattened sides of the chamber closely, but not to adhere to it. The draw-rod is attached to the disc or diaphragm at the centre of the same, and, passing through the large aperture, is attached, by means of a pin, to a working lever or beam, the draw-rod being slotted so as to admit of the pin and of the pins working freely therein. The working lever or beam is so connected with slides that the pressure of the water upon the disc moving the disc also operates the slide.

In constructing a meter upon this principle, it is preferred to use two of these arrangements of discs and chambers, and so dispose them in the meter-casing that one is on one side and one on the other side of a central plate or partition, which divides the meter into two compartments. By a suitable arrangement of inlet and outlet passages, the two discs are actuated by the fluid alternately, so that when the draw-rod of the first disc is at the end of its stroke the draw-rod of the second disc has commenced to move, and when the draw-rod of the second disc has in its turn arrived at the end of its stroke the first has again commenced to move, and so on while the fluid continues to flow through the meter; the motion of the slides is similar to that in steam-engines. The quantity of fluid passed through may be computed accordingly with the internal perimeter of the flattened spherical chamber; and it is proposed to connect with the working levers or beams attached to the draw-rods of discs any such arrangement of wheel-work as is now used for similar purposes to indicate the motions of the discs.

In constructing pumps for air, water, and other fluids, and pumps used for exhausting and ventilating purposes, according to this invention, it is proposed to use a central elastic disc or diaphragm of india-rubber or other suitable elastic material, and to attach at each side of the disc two recessed plates, or plates in the form of a portion of a sphere, the recessed part of each plate being farthest away from the central disc. Through the disc passes a spindle, to which the elastic disc is secured. This arrangement is placed in a tube, box, or chamber, and suitable inlets and outlets and valves are provided; then a to-and-fro motion or up-and-down motion being given to the spindle will draw and force the fluid by means of the action of the elastic disc, so as to form a continuous double-action pump or exhauster.

1329.—Thomas Crow, of West Ham, in the co. of Essex, creosote manufacturer, for "*An improved mode of and apparatus for burning hydrocarbon oils.*" Patent dated May 6, 1867.

In carrying out this invention an apparatus is employed consisting of a vaporizer and burner, in which a constant but regulated supply of hydrocarbon oil is maintained for the purpose of being converted into vapour and superheated, and in its superheated state consumed at the burner. The form of the apparatus employed will vary according to the circumstances of its application, and whether used for heating or lighting, but in all cases the same principle of construction and action will obtain—that is to say, first, the supply of oil will be continuous and at a pressure due to the elevation of the oil reservoir; second, the passage or passages for the escape of the vapour to, or its discharge from, the burner will be so proportioned as to produce a back pressure in the vaporizer; and, third, the heating surface and capacity of the vaporizer and burner will be such as to admit of the whole of the vapour generated being superheated before it passes off to be consumed.

The apparatus consists of a number of metal pipes coupled together, and so arranged as to require no further support. In its application to a horizontal circular boiler, as the fireplace is long and contracted laterally, the apparatus is elongated, and takes a kind of pyramidal form in end elevation; but in a fireplace circular in plan, the apparatus takes the form of concentric rings or coils, the flame from the burner being so directed as to heat the pipes forming the vaporizer without impinging upon them, and thereby effect the generation and superheating of the vapour. A vertical pipe leading from an oil reservoir conducts the supply of oil to a horizontal pipe, with one end of which it is connected by a union joint. The opposite end of this horizontal pipe is connected by a union joint with a second pipe which overlies it, and in like manner this pipe, at its opposite end, is connected to a third pipe placed above it and parallel thereto. From this pipe depends a junction which connects with a short transverse pipe; this pipe is formed with sockets to receive the ends of two horizontal pipes, which are pierced with a row of fine holes, and constitute the gas-burner. These pipes are braced together by means of clips, which are held fast by bolts and nuts, and to facilitate the cleaning of the pipes their ends are fitted with removable plugs. For cutting off the supply of gas to the burner a stop-cock is provided.

The apparatus requires in starting to be heated externally by the application of fuel. The oil is introduced by bringing the apparatus, through the opening of a tap in the vertical pipe, into communication with the supply cistern. The oil will then immediately upon its entrance be converted into vapour by the heat. The vapour so formed completes its circulation under pressure through the apparatus. As the vapour thus passes through the apparatus it is brought to a very high temperature, and is converted into permanent gas. The generation of the vapour is continuous, and the escape of the vapour at the entrance for admitting the oil from the supply-pipe of the oil-vessel is prevented by the pressure of the oil, and the escape of the vapour at its exit openings is partially obstructed by the smallness of the apertures through which it is discharged. An accumulation of vapour is thus kept up within the apparatus, whereby the pressure and the circulation are produced. The gas thus formed passes out from the burners, which are so placed in relation to the generator that the flame of the burners will supply the requisite heat to the vapour-generating apparatus, while at the same time the heat for raising the required steam-pressure will be imparted to the boiler. In order to steady the flame and diminish to any extent desired the intensity of the blast which the pressure imparts to the flame, a perforated disc or plug of iron is fixed in the end of the generator, which will act as a throttle or pressure-check, or a cock may be used for the same purpose.

1330.—John Henry Johnson, of 47, Lincoln's Inn Fields, in the co. of Middlesex, gentleman, for "*An improved mode of and means for lighting gas-lamps.*" A communication. Provisional protection only obtained. Dated May 6, 1867.

According to this invention the gas-jet can be lighted from the exterior of the lamp, and special doors or apertures in the body of the lamp for the introduction of the lighter are dispensed with. The essential feature of the invention consists in the combination with the ordinary burner tube of a second tube placed alongside it, and

parallel, or nearly parallel, therewith, such second tube serving for the transmission of the flame to the gas-burner. This tube is termed the "igniting" tube. It is in communication with the gas-supply pipe, either through the same cock which supplies the burner-tube, or through a special and separate cock of its own; but the first arrangement is preferred, the plug of the cock serving to open and close both the thoroughfares leading to the burner and "igniting" tube respectively.

1335.—Eugène Bourdon, of 36, Rue de Malte, Paris, in the empire of France, engineer, for "*Improvements in valves for regulating the flow of liquids, gases, and other elastic fluids.*" Patent dated May 7, 1867.

In the pipes used for conveying water, gases, or other elastic fluids, there are cocks, and clack and other valves, for regulating their distribution, and when the pressure of the fluid is very great, considerable power is required to open and to close these cocks and valves. To overcome this difficulty according to this invention a flexible valve is employed, which opens easily with very little force. This valve is nothing but a membrane—that is to say, a strip or band of supple material fitting exactly on the edges of the openings by which the water or the gases are to issue in order to close the said openings. This strip or band is attached to the end of a lever, which unrolls it in applying it on the orifice which is to be closed, or winds it up in lifting it when the orifice is to be opened. These valves are made of thin skin, of leather, of india-rubber, of gutta-percha, or other analogous material, according to the nature of the fluid which is to be retained, and also according to the dimensions which must be given to them. In every case these flexible valves must be of a material impervious to the fluid which is to be retained, and not to be attacked thereby. Thus, for water or air, the valves are made of leather, of india-rubber, of a woven fabric prepared with india-rubber, or of gutta-percha. For illuminating gas, they are made of greasy leather, of cloth or felt impregnated with a fatty matter, of sulphurized india-rubber, or analogous material. For steam, they may be made of wire gauze lined or coated with some soft and elastic material, which will fill its meshes. An assemblage of small copper plates might be used, brought edge to edge by hinges, which would give them the pliability requisite for winding up and unwinding the valve; or certain combinations of metallic plates and wires might be employed which have almost as much flexibility as membranes. It will be observed that one of the great advantages of these flexible valves is that they close hermetically by fitting exactly on the edges of the openings without any previous dressing or grinding of the surfaces in contact, which saves labour both in fitting these valves and in keeping them in repair.

1355.—Charles Layton, of Liverpool, in the co. of Lancaster, commercial traveller, for "*Certain improvements in the means of casting or producing parts of steam, gas, and water fittings, as also parts of lamps and other articles.*" Provisional protection refused. Application dated May 8, 1867.

These improvements in casting refer to the production of joints, plugs, and other like parts of steam, water, and gas fittings, parts of lamps, and other articles having reference to the description requiring much general subsequent labour in their finish, as, for instance, joints and plugs for water and gas fittings, and other like or similar articles or parts. The term small articles is used in its relative sense, restricting the moulds required to a convenient weight and size for use, which mould, being simple or compound, is formed for economy by preference of cast iron. The matrix of the article to be cast is finished or formed in two or more parts of the mould, connecting the said parts of the mould together in such a way that the mould may be readily opened and closed, so that the process of casting may be made continuous, and thereby keeping up a continued heat (from the frequent pouring of the molten metal) in the metal mould. Articles thus cast are susceptible of being formed hollow by the use of cores in the ordinary way, with the exception that greater truth will be preserved. Articles so produced will require considerably less work in the subsequent process of turning and finishing than when cast in the ordinary way, besides economizing not only the weight of metal in themselves, but preventing the large per centage of loss now sustained by manufacturers of such articles by the imperfect processes of casting now adopted.

1356.—Charles Denton Abel, of 20, Southampton Buildings, Chancery Lane, in the co. of Middlesex, patent agent, for "*A new or improved method and apparatus for converting the gaseous products of combustion into combustible gases.*" A communication. Provisional protection only obtained. Dated May 8, 1867.

The products of combustion, according to this invention, are made to pass from the furnace partly through a cylinder of refractory material filled with carbonaceous matter, and partly through a space surrounding such cylinder, so as to heat the carbonaceous matter contained therein. By these means that portion of the gases which passes through the cylinder is converted into combustible gases, as above stated, which may be used for heating purposes, either in the same furnace or elsewhere. The other portion of the gases, after imparting a portion of their heat to the contents of the cylinder, may be conducted into a chamber where they are employed to heat the air required for the furnace, which air is for this purpose conducted through a series of pipes in such chamber. Dampers or valves are provided for regulating the quantity and velocity of the gases passing through the apparatus. The cylinder is enclosed in a brick chamber, at the top of which is a hopper, provided with a slide for introducing the fuel, while access is gained through an aperture to the bottom of the chamber for removing the ashes from time to time. A passage or flue, communicating with the bottom of the chamber, conducts the converted gases to wherever required.

1371.—John Bowden, of Preston, in the co. of Lancaster, surveyor, for "*An improved 'bib,' 'stop,' or water-closet tap or cock.*" Provisional protection only obtained. Dated May 9, 1867.

According to this invention the water is received from the feed or supply pipe in a cup or socket thereon, in which is placed a ball of gutta-percha or other buoyant material. The outer portion of the cup or socket is chased or screwed so as to receive a cap or cover, projecting from the side of which is the discharge-pipe. At the joint between the socket and the cover is formed a flange, such joint being made perfectly water-tight by means of a ring or washer of india-rubber, which ring also forms the valve-seating. In the direction of the axis of the feed-pipe, and through the cover, is a piston-rod, working in a stuffing (or through a second ring of india-rubber), the internal end of the piston-rod having an enlarged concave end, the other or external end of such rod terminating in a button or thumb-piece.

The action of the tap or cock is as follows:—On the water entering the feed-pipe, the ball in the socket or enlarged end of such pipe is forced against the ring or washer forming the valve-seating, the pressure of water on the ball retaining it firmly on its seating until water is to be discharged, when pressure by the thumb on the button of the piston (or by a crank and lever) will, by the other or concave end of piston, remove the ball from its seat, and allow escape of water by way of discharge-pipe. Applied to water-closets the button end of the piston will be passed through the seat of the closet, or the seat may be hinged and rest on the button, so as to render the tap self-acting. In the supply-pipe near the tap or cock a syphon is constructed to prevent the passage of noxious gases to mains when empty.

1382.—George Mackenzie, of Glasgow, in the co. of Lanark, N.B., for "*Improvements in the manufacture of illuminating gas.*" Patent dated May 11, 1867.

This invention has for its object the obtaining of permanent gas of good illuminating power from materials of comparatively low cost, and it consists in mixing the comparatively poor gas obtained in the ordinary way from inferior bituminous coal with any desired proportion of a gas obtained from mineral oil mixed with minutely pulverized coke, charcoal, anthracite, lime, pumice-stone, iron, oxide of iron, clay, or asbestos.

The practical advantages of this invention arise from the fact that the gas obtained from mineral oil in the manner indicated is of comparatively high specific gravity, and is liable to lose considerably from condensation when kept for a short time; whereas, when it is mixed with a comparatively poorer gas, such loss from condensation does not take place, whilst the mixed gas is of a considerably higher illuminating power than the poor gas by itself. The pulverized material used with the oil does not itself form gas, but serves to retain the oil by its absorbent action, and thus preventing the gas from being too rapidly thrown off by the heat, renders it less liable to subsequent loss by condensation. By the term "inferior bituminous coal" is designated not only the poorest bituminous coal that may be used for gas-making, but also any bituminous coal that is at all inferior to the richest Boghead or cannel coal used for gas-making. It is considered to be a modification of the invention to mix the gas obtained (in the manner herein described) from mineral oil with the gas obtained from a mixture of Boghead or cannel coal with inferior coal, or with gases obtained separately from coals of different qualities. The gases may be mixed in various proportions, according to the illuminating power required. For example, where gas-retorts are arranged in benches of nine retorts each, mineral oil may be used in one or perhaps two retorts of each bench, and coal in the others, the hottest retorts being selected for the oil. The mineral oil may be mixed with the pulverized substance before putting it into the retorts, or the oil may be injected continuously or intermittently upon the pulverized substance when in a heated state in the retorts. If pulverized coke is used, for example, and if the mineral oil is mixed with it before being charged into the retort, it is preferred that they should be in the proportions of from 30 to 50 gallons of oil to every ton of coke, the quantity of oil being inversely regulated by its volatility, and in charging it is preferred to fill each retort to the extent of from one to two thirds. When the oil is injected separately into the retort it is preferred that the pulverized substance should occupy from one to two thirds of the capacity of the retort. The oil may be injected by means of one or more pipes leading from an overhead tank or cask giving sufficient head. The mixing of the gases may be effected by simply allowing them to mingle in the pipes or in the same gasholder or gasholders; it is, however, advantageous for the intermixing to be thorough and complete, and in works where gas exhausters are used it will be useful to lead the two gases through them together. The pulverized material may be repeatedly reused.

1384.—William Bracewell, William Pickup, and Benjamin Lund, all of Burnley, in the co. of Lancaster, engineers, for "*Improvements in valves for steam and other fluids.*" Patent dated May 11, 1867.

This invention consists in making the seating of the valve with two or more faces. This seating is provided with a lid or cover with a corresponding number of faces, and the faces of both seating and cover will be so perforated as to allow the cover to be in equilibrium, or otherwise, if preferred. It is proposed to make valves on the above principle either round, square, oblong, or polygonal, and to arrange them so as to have a separate valve for the admission of steam and for the exhaust; or so that one valve will answer for both admitting the steam and for exhausting.

1407.—William Robert Lake, of 8, Southampton Buildings, Chancery Lane, in the co. of Middlesex, consulting engineer, for "*An improved mode of constructing metal cocks, faucets, and other similar articles.*" A communication. Patent dated May 11, 1867.

This invention consists, chiefly, in forming a cock, faucet, or other article, in parts or sections, which are cut or stamped from sheet brass or other suitable metal, and united by brazing and soldering,

and also in the employment in combination with the same of a hollow plug formed of sheet brass or other suitable metal.

1418.—Martin Dadd Rogers, of East India Road, Poplar, and Joseph Wilson, of Wade Street, Poplar, both in the co. of Middlesex, for "*An improved fire-escape, parts of which are applicable to the ventilation of buildings and the extinguishing of fire therein.*" Provisional protection only obtained. Dated May 13, 1867.

This invention consists in constructing a fire-escape in the following manner, that is to say:—To the upper windows, by preference, and to the brickwork at each side thereof, and outside of the building, is hinged a bar or "davit" by its lower end, and to the upper end of each bar or davit aforesaid is connected one end of a chain or fire-proof rope, the other end whereof is connected to a counterbalance weight sufficiently heavy to balance a cage or balcony slung by its ends, or suspended from the upper ends of the aforesaid bars or davits. It is proposed to pass a tube or tubes through the several floors of a house or other building, and allow the counterbalance weights before mentioned to pass freely up and down the said tubes, so that, supposing the fire-escape to be in use, and persons to have entered the cage or balcony, they can lower themselves down by means of a chain or other suitable contrivance, and when they get out the cage or balcony will be lifted up by the counterbalance weights before mentioned, thus rendering the fire-escape self-acting. The tubes containing the counterbalance weights it is proposed to connect by their lower ends with a water-main, fitted with cocks for establishing a communication with the main when it is required to use the aforesaid tubes for extinguishing fire in a house or other building, and the said tubes are perforated for the escape of water into the rooms of a house, the said perforations being made near the ceiling by preference. By these means a large body of water may be discharged inside a house. The aforesaid tubes, when not charged with water, serve to carry off the vitiated air from rooms, the air entering the tubes by the perforations therein, and passing off through the upper ends thereof into the open air.

1426.—Josiah George Jennings, of Palace Road, Lambeth, in the co. of Surrey, sanitary engineer, for "*Improvements in water-closets and sinks, and in apparatus for supplying water thereto and conducting it therefrom, parts of which apparatus are applicable to other purposes.*" Patent dated May 14, 1867.

According to this invention water-closets are arranged in such manner that, whilst the excrementitious matters which the basin may receive, together with the small quantity of water which the basin holds, are discharged into a receiver, so as to be applicable for use as a manure, the comparatively large quantities of water which are used to scour the basin are kept out of this receiver, and directed away into a sewer or otherwise, as may be desired, but without mixing with and diluting the excrementitious matter, which is consequently discharged almost in an undiluted state into the receiver, whatever be the quantity of water used to cleanse the pan. For this purpose a pan with a valve at the bottom is employed, and when this valve is opened the matters in the pan press into the manure-receiver. The same act of opening the valve of the pan also in the usual way opens a valve for the supply of the scouring water, and this water-supply valve is so arranged, as is well understood, as to remain open for a regulated time. The scouring water is, however, prevented from passing into the pan so long as the valve of the pan is closed. The scouring water is admitted and the excess passes away by a side opening from the pan, leaving therein only a small quantity of water, say a depth of half an inch, but more or less, as may be desired, and sufficient to prevent the adhesion of soil.

1427.—Alexander Melville Clark, of 53, Chancery Lane, in the co. of Middlesex, for "*Improvements in the means of raising liquids, and in apparatus for the same.*" A communication. Patent dated May 14, 1867.

This invention relates to an improved method of raising fermented and other liquids by the pressure of carbonic acid gas, which latter becomes compressed in proportion as it is used. The carbonic acid gas is produced pure by the reaction in a wet state of tartaric acid on bicarbonate of soda; in this manner, washing and purifying apparatus is dispensed with. The reaction is operated in any suitable chamber or capacity of sufficient strength, the affinity of the acid for the salt being such that a relatively considerable pressure is produced by the generation of the gas. The generator may contain ice for cooling the carbonic acid gas, and it is also enclosed in strips of cloth, coal, or sawdust, or other non-conductor of heat. The carbonic acid gas produced under pressure in the generator passes into a condensing-reservoir provided with a pressure-gauge, and is supplied to the cask or vessel by the aid of a cock and supply-valve acting on the liquid to be raised.

1448.—George Tomlinson Bousfield, of Loughborough Park, Brixton, in the co. of Surrey, for "*A new and useful method of manufacturing illuminating gases.*" A communication. (Complete specification.) Patent dated May 16, 1867.

The ordinary methods of manufacturing what are called "illuminating gases" are neither productive of economy nor gases of a satisfactory character; and the manufacture is a great nuisance in all cities and towns where the gases are made, and noxious not only to the operators, but also to the public health. To obviate these objections and at the same time produce a good artificial light so as to cheapen one of the prime necessities of life constitute the new system of gas manufacture which is the subject of this patent, and the *modus operandi* of which is as follows:—An ordinary bench consisting of the usual number of retorts or any number desirable may be employed. The retorts are D-shape, and arranged in a bench in the usual way, but instead of only one mouthpiece to each retort there are two, one attached to either end. The stand-pipe is situated at the back end of each retort instead of the front, as is usual in gas-works; to each of the front mouthpieces is attached an upright supply-pipe which terminates in a rotary valve; the front mouthpiece contains a slide or piston, to this slide is attached a rod protruding through a stuffing-box in the lid of the mouthpiece. To the under side of the mouthpiece on the opposite end of each retort is attached a discharge pipe or tube which is made to dip into a reservoir of coal tar or other suitable liquid; a valve should be placed in the mouthpiece above the reservoir, and covers when closed the upper and open end of the discharge-tube. This valve is only designed as a convenience to close the report when the process is not in operation or in case of repairs.

The gas coal is introduced in small charges and at intervals into the supply-tube through the rotary valve which is made gas-tight, and as the valve rotates a certain quantity of coal drops into the front mouthpiece, and is carried or pushed forward by the slide (which is operated by the projecting rod) into the heated retort, which is maintained at a full red heat, or a heat approaching to whiteness, according to the character of the material subjected to the process. As each charge of fresh coal is pushed forward by the slide the previous charges already in the retort are progressively advanced in it, and the one that is farthest from the charging end is ejected and permitted to drop through the discharge pipe or tube into the reservoir. The gas contained in the chambers of the valve taken up from the tube as the valve rotates is displaced by exhaustion and discharged into the main leading to the gasholder. The coal occupying each retort is composed of four equal parts which have been charged into it in succession; as the first part of the coal (or that at the charging end) approaches the heat the volatile products begin to be given off from the coal, which, as it is slowly carried forward in a thin stratum under a greater heat, parts with all the volatile substances it is capable of yielding, and where these substances are converted into permanent gases. After the volatile products are mostly given off from the first portion of the coal it is pushed forward in the retort, where it is retained until all the gases are given off, after which this portion of the coal which has now become coke is moved onward, and the aqueous vapour formed in the retort is brought in contact with the highly heated coke, by which means a portion of the aqueous vapour is decomposed; the whole of the aqueous vapour may be decomposed by the additional aid of electricity. Two platinum wires are introduced through insulators which are inserted in the lids of the mouthpieces of each retort, and the wires brought within a few inches of each other in the hottest part of the retorts; these wires are connected with a thermo-electric or other battery, and constitute positive and negative poles. The coke is then pushed forward and drops into the discharge-pipe, and is raked up from the bottom of the reservoir on an inclined plane, where the tar is allowed to drain off from the coke and flow back again into the reservoir. In the meantime other portions of coal are brought forward in the same way, by which the operation is made continuous without opening the retorts for the supply of coal or the discharge of coke. The object of placing the stand-pipe at the rear end of the retorts instead of the front, as is usual, is to afford a free and immediate exit for the gases from the retorts nearest the point where they are formed.

1458.—Hector Auguste Dufrené, of 10, Rue de la Fidélité, Paris, in the empire of France, and 4, South Street, Finsbury, London, civil engineer, for "*An apparatus for transferring heat from one current of gas to another.*" A communication. Provisional protection only obtained. Dated May 18, 1867.

The objects of this invention are to collect the caloric contained in a current of hot gases for the purpose of heating a current of cold gases (and in practice also for heating cold gases or cooling hot gases), and to obtain this double action in a continuous manner; and the invention consists in the construction of apparatus by which these objects may be effected. This object may be obtained by means of a receiver containing metallic gauze or plates, forming large absorbent and repelling surfaces, and through each part of which the two currents successively pass in opposite directions. When the hot current passes through, the metal surfaces are heated by contact with the gases, which are thereby gradually cooled, and which at their outlet are relatively cold. The cold current acting inversely will cool such metal surfaces, the caloric of which will heat the cold gases, which at their egress will be relatively hot, so that the caloric abstracted from the hot will be transferred to the cold gases. The apparatus may be constructed in various ways.

1474.—James Theodore Bland and Edwin John Bland, of 15, Broadway, London Fields, Hackney, plumbers, and Thomas Brevetor, of 9, Ash Grove, Hackney, gentleman, for "*More effectually regulating the supply of water or other fluids to cisterns or other receptacles, and for economizing the trouble and expense connected therewith by means of an apparatus to be called 'Bland's improved ball-cock.'*" Patent dated May 18, 1867.

This apparatus is so constructed as to be, when fixed, without any opening whatever, except the one expressly intended for the outflow of the liquid, whereby the possibility of leakage is reduced to a minimum. The valve is made wholly of metal, without the aid of any other material, such as leather, india-rubber, &c. By the construction of the apparatus the pressure of liquid in the supply-pipe aids in perfectly closing the valve, and therefore a proportionately smaller lever and ball are required than usual. The connexion of the spindle in the valve with the lever and ball is made beneath or beyond the point of outflow. It can be removed or replaced without trouble or necessity for plumbers joints. The construction or mode of action is such as to occasion the least possibility and liability to get out of order by grit or sediment, as the flow of the liquid acts as a continuous lubricator, and washes away any obstruction that may be present. And, lastly, it can be manufactured in any metal equally or more economically than any known similar apparatus.

1487.—Thomas Metcalf, of Newton Heath, near Manchester, in the co. of Lancaster, for "*Improvements in burning all hydrocarbon oils, such as creosote, petroleum, paraffin oil, shale oil, gas tar, and other similar products capable of being used as fuel.*" Patent dated May 20, 1867.

This invention consists in improved arrangements and apparatus for converting hydrocarbon oils and similar matters into gas before they are consumed, which arrangements and apparatus are applicable to stationary, marine, and locomotive boilers, retorts, stills, warming-pans, and all purposes where heat is required. A gas-box of metal or other material is constructed of any suitable length and transverse shape or section, according to the demand for heat or the purpose to which the heat is to be applied. To the top of the gas-box, near its front end, is attached a feed-pipe communicating with the reservoir containing the hydrocarbon, the pipe being provided with a tap for regulating the supply or shutting the supply off. There is also attached to the top of the gas-box a safety-pipe, with a tap or valve for preventing the danger of explosion, and at the opposite or back end of the box small holes are drilled. The gas-box is fitted into the front of the flue of the boiler, or other vessels, and the front end of the gas-box is heated by ignited fuel in a small stove or grate, and when the tap of the feed-pipe is opened the hydrocarbon, after entering the gas-box, is immediately converted into a large volume of gas, which rushes through the small holes into the flue, and then being ignited, gives out an immense body of flame with an intense heat, there being neither smoke nor smell when the supply is properly regulated. It is preferred to employ a separate cover at the front of the gas-box fixed by bolts or screws, and to have in the cover as many stuffing-boxes as there are small holes at the back of the gas-box, for holding rods in the pointed ends for cleaning the small holes, and closing them when required.

1513.—Andrew Barclay, of Kilmarnock, in the co. of Ayr, N.B., for "*Improvements in apparatus for injecting and ejecting liquids and fluids.*" Patent dated May 21, 1867.

This invention more especially consists in the construction of metallic packing applicable to the above-named apparatus, which may be employed to render steam-tight the moving or sliding joints in instruments of that class. Under one modification the packing consists of a metallic ring, which is soldered or otherwise fixed to the tubular part. This ring is of a conical form, and several long narrow slits or openings are cut into it by a saw or otherwise. A second ring of corresponding shape is also soldered or otherwise fixed to the tubular part close to the first ring, the inner surface of the second ring being made to exactly correspond to the outer surface of the cut ring. This second ring is made by preference of thin brass, and its outer diameter is made slightly larger than the interior chamber of the outer part of the instrument, so that on being placed therein the rings are slightly compressed, and the outer ring is thus held against the inner side of the cylinder casing of the instrument to an extent sufficient to render the joint very effective and steam-tight, the inner ring, acting as a spring, forcing against the outer one.

1529.—Ebenezer William Hughes, of 5, Queen Street, Westminster, and Thomas Howard Head, of 9, Dowgate Hill, in the City of London, for "*Improvements in rotatory engines and pumps.*" Provisional protection only obtained. Dated May 22, 1867.

Much difficulty has hitherto existed in the production of a complete rotary engine, in which action and reaction are equal, and in which there is no loss while the piston is passing the valves; also in turbines, from the rush of water only being made available; and in pumps and exhausters, from the column of water not being kept always in motion, but constantly checked and started again. The object of this invention is to overcome these difficulties, and produce a complete rotary engine which maintains the action and reaction always the same, and all the pressure that is employed therefore effective, the pressure of the power always acting continuously, according to the area of the piston and the pressure employed. This is accomplished by means of an annular cylinder, in which rotates a piston made tight, and carrying round with it on either side an induction and an eduction pipe; these pipes connect with the centre pipe, which also forms the axis and medium of motion. In this cylinder are placed two or more valves, as may be required, which are withdrawn as the piston passes.

1530.—Frederick Hardwick Johnson, firm of Cotton and Johnson, of Grafton Street, Soho, in the co. of Middlesex, for "*Improvements in gas blow-pipes, and in blow-pipe torches or flames.*" Patent dated May 23, 1867.

This invention consists first of an improved gas blow-pipe, whereby the gas jet or flame can be increased or diminished with the greatest nicety; and, secondly, of an improved flame or torch-holder to be used therewith or with any other blow-pipe, or the gas connecting-tube pipe, separately or combined therewith as hereinafter described.

In carrying out the first part of the invention the blow-pipe is formed of nearly the same shape as that ordinarily used for soldering with gas, but with this difference, that in the pipe to which the gas connecting-tube is attached there is formed a hollow chamber, by turning which from right to left, and *vice versâ*, the gas is admitted through a double-coned plug or valve or hollow-coned valve, and accumulates and passes through a suitable opening into the blow-pipe gas-tube, whence it makes its exit in the usual way, the blower being fixed at the head of the gas-pipe to act on the flame. A short distance beyond the gas-chamber the outside tube is cut or divided by slots or openings through which the air passes, and at or near the flame mixes with the gas in its exit from the gas-chamber, the draught being sufficient to prevent any escape, and a sliding collar or band passes over and from the said openings or slots more or less as required and regulates the admission of air, thereby preventing the deposit of carbon.

1560.—Henry Bernoulli Barlow, of the city of Manchester, patent agent, for "*Improvements in apparatus for coupling pipes.*" A communication. Patent dated June 27, 1867.

This improved apparatus is applicable in coupling steam, gas, water, and other pipes, having a socket at one end, into which the end of another pipe fits. It consists of four or other convenient number of segments, connected together by a hoop; one end of the segments is recessed to fit on the socket of the pipes to be coupled, and to the inside of each segment is screwed a thin steel blade, and these blades are surrounded by a ring or hoop of india-rubber or other packing. The apparatus having been placed on the socket of the pipe, the end of the pipe to be coupled is forced within the blades of steel, thereby expanding them and the packing-ring inside the socket; the hoop is then knocked off the segments, and the segments with the blades of steel are drawn out of the socket, leaving the packing-ring in its place. By this apparatus pipes can be coupled very expeditiously, and the packing-ring is sure to be left in its proper place within the socket.

1561.—Herbert Frost, sen., and Herbert Frost, jun., both of the city of Manchester, machinists, for "*Improvements in apparatus for measuring fluids, which improvements are also applicable for obtaining motive power and for pumping.*" Patent dated May 27, 1867.

This improved apparatus consists of a ram or plunger made square by preference, but which may be of any other convenient form. The ram works to and fro in an angle, step, frame, or bearing, fixed inside the casing of the meter by means of screws, and above it is a moveable packing, which is kept up to the frame by plates or holders; the packing is capable of self-adjustment to the upper faces of the ram to compensate for the wear of the parts, being free to move between the frame and the holders for that purpose; by this means a perfect metallic fluid-tight joint is obtained. The casing is divided into the two measuring chambers by a frame, or bearing, and packing, and into a third chamber, containing the valves, by a partition. The valve-rod passes through one end of the ram and the last-named partition, and is connected to the top supplementary valve; the top valve works to and fro on a fixed angle piece, through which are water-ways to convey the fluid to a moveable valve-box; this valve-box works in the lower part of the angle piece. Within the valve-box is the mid-feather, cast or fixed to the angle piece. This valve is an improvement upon the valve described in the specification of Letters Patent, granted to the above-named Herbert Frost, sen., on the 22nd of October, 1861, No. 2635, by which friction is reduced and greater accuracy obtained. There are three ports which are in communication with the various parts of the meter. The water enters the meter through the inlet passage, and passes through a dirt-box and grid into the valve-chamber.

The above-described apparatus may also be employed as a water pressure or other motive-power engine, either by using two ram connected together to a crank-shaft, or with one ram having a rod, crank-shaft, and link connected to the ram, as in ordinary steam or other engines. In the above cases ordinary slide-valves may be used instead of the valves described, and also by actuating the ram so as to cause it to force the fluid, instead of being forced thereby. The apparatus may be used as a pump; in this case ordinary lift or flap valves may be used instead of the valves described.

1578.—Henry Cockey and Francis Christopher Cockey, of the firm of Edward Cockey and Sons, of the Iron-Works, Frome, in the co. of Somerset, engineers, for "*Improvements in seal or dip pipes in connexion with gas and other retorts.*" Patent dated May 28, 1867.

This invention relates to a peculiar construction and arrangement of what is called the seal or dip pipe in connexion with gas and other retorts, whereby the seal-pipe can be unsealed as soon as the retort is charged, so that all pressure on the retort caused by the seal or dip of the pipe is at once removed. The invention is applicable to any shifting pipe whereby this object can be obtained, but it is preferred that the pipe be made telescopic, and raised out of the tar or liquor in the hydraulic main by means of a lever and rod fixed in such a manner that the man charging can, as soon as he has closed the retort, raise the seal-pipe out of the tar or liquor, and thus unseal it, and before opening the retort for charging he can lower the pipe again into the tar or liquor and reseal it. Arranged in this manner the seal-pipe also acts as an expansion sliding-pipe between the retort and the hydraulic main.

1628.—Anton Georg Schaeffer, of Gloucester Street, Newcastle-on-Tyne, for "*Improvements in obtaining increased light in the combustion of illuminating matters.*" Provisional protection only obtained. Dated June 1, 1867.

This invention consists in effecting approximation of incandescent atoms, or clusters of atoms, by the approximation or coalescence of two or more flames containing these atoms, and in such manner as to obtain the most close possible approximation of the heated atoms in one flame to the heated atoms in another, but not so as to cause gases to unite before ignition.

1668.—Thomas Sturgeon, of Manchester, in the co. of Lancaster, engineer, for "*An improvement in street and similar lamps.*" Provisional protection only obtained. Dated June 7, 1867.

This invention consists in using, instead of the four glass sides which form the upper part of street and similar lamps, pieces of tin or other substance possessing a bright reflecting surface, so that the light which at present passes through the glass in the upper part of the lamp will be reflected down again into the street, and thus increase the effective illuminating power of the lamp.

1671.—Augustus Lea Bricknell, of Stratford-on-Avon, in the co. of Warwick, for "*Improvements in rotary pumps.*" Patent dated June 7, 1867.

The invention has for its object improvements in rotary pumps, and relates to pumps having a cylindrical chamber in which revolves a cylindrical centre-piece fixed upon a suitable axis, such centre-piece being provided with flanges, the peripheries of which fit accurately the bore of the chamber, and also with sliding pistons, which are acted upon by cams at the times desired to enable them to pass an abutment or partition; and the invention consists in giving a tapered sectional form to the annular space enclosed between the two flanges carried by the rotating cylindrical centre-piece. The abutment or

partition is formed at the part acting within such tapered annular space of a corresponding shape, such abutment or partition being formed by preference of gutta-percha or other similar material, and being held in a suitable space formed in the cylindrical chamber, but capable of being pressed up by springs or otherwise, or of falling by its own gravity as wear takes place, so as always accurately to fit the tapered annular space in the cylindrical centre-piece, the sliding pistons are covered with leather, gutta-percha, india-rubber, or other suitable soft material.

1673.—HENRY CROW, of the city of Manchester, in the co. of Lancaster, engineer, for "*Improvements in hot water apparatus for heating and warming purposes.*" Provisional protection only obtained. Dated June 7, 1867.

These improvements consist in concentrating the heated currents of water arising from the heating surfaces of the boiler and directing them into a separate compartment at the upper part of the boiler, and in making the outlet for hot water from this compartment, and after circulating the hot water through the pipes returning it cooled to the bottom of the boiler to a cavity, vessel, or compartment under or around the boiler and ashpit.

1684.—JAMES WARBURTON, of Hythe, in the co. of Kent, for "*Improvements in apparatus for registering and recording the quality of gas.*" A communication. Patent dated June 7, 1867.

This invention has for its object improvements in apparatus for registering and recording the quality of gas. For this purpose a gas-meter is employed, in the exit-pipe from which is placed a disc of platinum having a small hole formed through it, through which the gas in escaping has to pass. If gas of a light specific gravity is coming through the meter, the gas will pass quickly through the fine hole; whereas if the gas be of a heavier specific gravity it will not escape so readily, and consequently the drum of the meter will make fewer revolutions in a given period of time than when a gas of light specific gravity is passing.

In order to record the number of revolutions made by the drum of the meter, a cam is placed on or geared with the axis of the drum, which cam is so formed that at each revolution it first raises one arm of a lever resting upon it, and then allows it to drop suddenly. As this arm of the lever is being raised, its other arm depresses the short arm of a bell-crank lever, the longer arm of which carries a fine needle point; and, when the cam allows the lever to drop, the bell-crank lever is acted on by a spring, so as to quickly shoot forward the needle-point, which then passes through a disc of paper, carried by a wheel or disc, to which a slow rotating motion is given by clock-work, it being, by preference, caused to make one revolution every 24 hours. Immediately after the point has punctured the paper it is withdrawn by a counterbalance weight. The needle point is moveable on the arm of the bell-crank lever, so that it may be set to puncture the paper disc at different distances from the centre; and thus the same disc may be used for more than a single day. The face of the disc of paper has divisions marked upon it, in a similar manner to the dial of a clock; thus the number of revolutions of the meter in a given space of time will readily be seen, by the number of perforations made in the paper disc during that time. The meter is furnished with a water-gauge, in order that the water level may be accurately maintained. A thermograph is also applied to the inlet-pipe of the meter, in order to record the temperature of the gas passing through it; and also an apparatus is applied for registering the pressure of the gas passing to the meter. In order to maintain a regular flow of gas, and prevent the flow being affected by currents of air, the gas, after passing through the fine hole in the disc across the exit-pipe, is led by the pipe into a closed vessel partially filled with water; the end of the pipe dips below the water, and the gas in escaping rises up through it, and is led away by a pipe passing from the top of the vessel. A constant water level is carefully maintained in this vessel by the aid of a water-gauge.

1694.—NATHAN THOMPSON, of 15, Abbey Gardens, St. John's Wood, in the co. of Middlesex, for "*Improvements in unions or apparatus for connecting together pipes or tubes, and for stopping the ends thereof.*" Patent dated June 8, 1867.

For the purposes of this invention a socket open at each end is employed, containing within it a packing consisting of a short length of india-rubber tube or other suitable material. The ends of the two pipes or tubes to be connected are butted together at or near the centre of the socket, and within the packing, into which the ends of the pipes or tubes are just able to enter loosely; the packing is then compressed so as to make it fit closely both to the pipes or tubes, and also to the socket, and so a tight joint is made.

1710.—HENRI ADRIEN BONNEVILLE, of 38, Porchester Terrace, Bayswater, in the co. of Middlesex, and 24, Rue du Mont Thabor, Paris, in the empire of France, patent agent, for "*Improvements in vessels, more particularly such as are used for the reception or deposit, or both, of offal, excrement, urine, or other fœcal or waste matter or substance.*" A communication. Provisional protection only obtained. Dated June 11, 1867.

These improvements relate principally to the lid or cover of such vessels, although it can be adapted to some part or portion of the body of the vessels, and the principle of the invention simply consists in so forming such vessels, or their lids, or covers, or any part connected with either, as to adapt them to the reception and holding of any deodorizing or preservative material, substance, compound, or liquid, for fœcal or other refuse matters, in a manner independent of and free from the fœcal or other waste matter which the vessels may contain, and either in combination or not; with so constructing such chambers or receptacles of the vessels or their covers or lids for the deodorizing or preservative agent used, that at any time or times, when so desired, such agent can be discharged into the vessels in quantities more or less great according as may be necessary to produce the required effect upon the fœcal or other waste matter contained therein, without opening such vessel or exposing its contents to the air, when, by closing such communication, the discharge of the preservative deodorizing agent into the vessels can be stopped.

APPLICATIONS FOR LETTERS PATENT.

175.—BENJAMIN THEOPHILUS MOORE, of Elm Lodge, Spring Grove, Isleworth, in the co. of Middlesex, civil engineer, for "*A new or improved apparatus for protecting water-pipes from injury by frost.*" Jan. 18, 1868.

176.—EDWARD DORSETT, of 12, London Street, in the City of London, for "*Improvements in the utilization of coal tar and the products arising from the distillation thereof.*" Jan. 18, 1868.

182.—AUGUSTE BOCHKOLTZ, of the city of Vienna, in the empire of Austria, civil engineer, Inspector-General of Railways, for "*An improved mechanical arrangement to be employed in connexion with self-acting valves.*" Jan. 18, 1868.

237.—WILLIAM ORAM, of Salford, in the co. of Lancaster, hydraulic engineer, for "*Improvements in apparatus to be employed for heating buildings and for other heating purposes.*" Jan. 23, 1868.

238.—DAVID YOOLOW STEWART, of Glasgow, in the co. of Lanark, N.B., ironfounder, for "*Improvements in the manufacture of cast-iron pipes and similar articles.*" Jan. 23, 1868.

239.—HENRY HODGE, of Southport, in the co. of Lancaster, ironmonger, for "*Improvements in gas-stoves for heating purposes.*" Jan. 23, 1868.

247.—STROTHER PRICE, of Highbury, in the co. of Middlesex, for "*An improved mode of and means or apparatus for turning on and off the supply of gas to houses, also applicable to turning on and off the supply of other fluids.*" Jan. 23, 1868.

253.—ANDREW SMALL, of Glasgow, in the co. of Lanark, N.B., for "*Improvements in apparatus for removing excrements.*" Jan. 24, 1868.

254.—EDWIN WILLIAM DE RUSETT, of Lewisham, in the co. of Kent, engineer, and RICHARD FARRELL DALE, of Shoe Lane, in the City of London, founder, for "*Improvements in water-closets.*" Jan. 24, 1868.

257.—THOMAS LESSLIE GREGSON BELL, of Plaistow, in the co. of Essex, for "*Improvements in preparing oxide of iron for purifying gas, and in treating the oxide of iron residues to obtain products therefrom.*" Jan. 24, 1868.

265.—CHARLES RITCHIE, of Brixton, in the co. of Surrey, gentleman, for "*Improvements in apparatus for utilizing heat for heating, warming, and ventilating, whether such heat be procured by the agency of steam-boilers, furnaces, or from other sources.*" Jan. 25, 1868.

277.—THOMAS DICKINSON, of Lancaster, in the co. of Lancaster, plumber, for "*Improvements in apparatus for drawing off water.*" Jan. 27, 1868.

284.—JOHN ROBERTS, of West Bromwich, in the co. of Stafford, ironfounder, and JABEZ MORGAN, of Kidderminster, in the co. of Worcester, manager of works, for "*Improvements in joining metallic pipes.*" Jan. 27, 1868.

292.—GEORGE NICHOLAS SANDERS, of 16, Rue de Sèze, Paris, gentleman, for "*Improved apparatus for regulating and increasing light in burners for gas, oil, petroleum, and other volatile oils.*" Jan. 28, 1868.

293.—THOMAS HYDES, of Sheffield, in the co. of York, ironmonger, and JOSEPH BENNETT, of Sheffield aforesaid, engineer, for "*Improved means or appliances for facilitating the transit and application of caloric; also for mixing caloric with air, water, and other fluids and gases; also for economizing the consumption of fuel, consuming smoke, generating steam, and increasing and distributing heat, and for refrigerating purposes.*" Jan. 28, 1868.

300.—ALFRED COLERICK PILLINER, of the Oakfield Works, near Newport, in the co. of Monmouth, civil engineer, and JAMES CHARLES HILL, of the same place, ironmaster, for "*Improvements in machinery for obtaining motive power, applicable also to measuring, raising, exhausting, forcing, and compressing fluids.*" Jan. 28, 1868.

306.—ROBERT WILSON, of the city of Manchester, in the co. of Lancaster, ironmonger, for "*Improvements in connexions or joints for conveying fluids and liquids through pipes.*" Jan. 29, 1868.

311.—DAVID LAW, ironfounder, and JOHN WHARRIE, foreman, both of Glasgow, in the co. of Lanark, N.B., for "*Improvements in the manufacture of cast-iron pipes and similar articles, and in apparatus therefor.*" Jan. 29, 1868.

323.—HENRY ALAND, of 18, Richard Street, Roupell Street, Lambeth, London, in the co. of Surrey, for "*Improvements in rotary blowing-fans for producing blast for furnaces and other purposes, which improvements may also be applied to air and gas exhausters.*" Jan. 30, 1868.

GRANTS OF PROVISIONAL PROTECTION.

3682.—JOHN WILLIAM LEWIS, of the town and co. of Newcastle-upon-Tyne, engineer, for "*Improvements in warming, ventilating, and heating apartments or buildings, and in the arrangement of apparatus connected therewith.*" Dec. 27, 1867.

22.—JAMES SEPTIMUS COCKINGS, of Birmingham, in the co. of Warwick, civil engineer, and FERDINAND POTTS, also of Birmingham aforesaid, manager of works, for "*Certain improvements in welded iron tubes for gas and other purposes where strength and lightness are required.*" Jan. 3, 1868.

40.—EUGÈNE GOURDIN, of 113, Boulevard Sebastopol, Paris, merchant, for "*Improvements in the modes or methods of combining a lamp or lighting appliance with a cane or walking-stick.*" Jan. 6, 1868.

78.—WILLIAM EDWARD KENWORTHY, of Crown Point Road, Leeds, in the co. of York, agricultural chemist and oil merchant, for "*An improved method of purifying drains and sewers.*" Jan. 8, 1868.

117.—JOHN MALSBURY KIRBY, of Northampton, in the co. of Northampton, for "*Improvements in the means of and apparatus for generating steam and warming buildings.*" Jan. 13, 1868.

138.—JOSHUA KIDD, of St. Paul's Wharf, in the City of London, engineer, for "*Improvements in obtaining artificial light, and in apparatus employed therein.*" Jan. 15, 1868.

142.—JASON EGGLETON, of 22, Old Town, Clapham, in the co. of Surrey, for "*Improvements in the manufacture of 'bellows regulators' for water-closets.*" Jan. 16, 1868.

146.—CLINTON EDGCUMBE BROOMAN, of the firm of Robertson, Brooman, and Company, of 166, Fleet Street, in the City of London, patent agents, for "*Improvements in gas heating and cooking apparatus.*" A communication. Jan. 16, 1868.

175.—BENJAMIN THEOPHILUS MOORE, of Elm Lodge, Spring Grove, Isleworth, in the co. of Middlesex, civil engineer, for "*A new or improved apparatus for protecting water-pipes from injury by frost.*" Jan. 18, 1868.

182.—AUGUSTE BOCHKOLTZ, of the city of Vienna, in the empire of Austria, civil engineer, Inspector-General of Railways, for "*An improved mechanical arrangement to be employed in connexion with self-acting valves.*" Jan. 18, 1868.

NOTICES TO PROCEED.

2621.—ALEXANDER MELVILLE CLARK, of 53, Chancery Lane, in the co. of Middlesex, for "*Improvements in valve-closets apparatus, part of which is applicable for regulating the flow of water in other cases.*" A communication. Sept. 17, 1867.

2625.—THOMAS ADAMS, engineer, and GEORGE JOHN PARSON, gentleman, both of 5, Duke Street, Adelphi, in the co. of Middlesex, for "*Improvements in and applicable to slide-valves.*" Sept. 18, 1867.

2641.—WILLIAM POTTS, of Handsworth, in the co. of Stafford, manufacturer, for "*Improvements in apparatus for ventilating rooms and buildings.*" Sept. 20, 1867.

2665.—ANGUS MACKENZIE, of Capel Street, Dublin, plumber, and SAMUEL ROBINSON, of Brunswick Street, Dublin, foreman builder, for "*Improvements in apparatus to be applied to cisterns for preventing waste of water.*" Sept. 21, 1867.

2701.—WILLIAM WOODCOCK, of Pimlico, in the co. of Middlesex, engineer, for "*Improvements in apparatus or arrangements for warming and ventilating buildings.*" Sept. 25, 1867.

2811.—NATHANIEL FORTESCUE TAYLOR, of 8, Manby Street, Stratford, in the co. of Essex, gas engineer, for "*Improvements in means or apparatus to be used in impregnating air and aëriform fluids or gases with hydrocarbons, and in burners used in burning the inflammable air obtained, which burners are also applicable when burning other gaseous fluids.*" Oct. 5, 1867.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

85.—WILLIAM EDWARD GEDGE, "*An improved apparatus for cutting iron gas or other pipes.*" Jan. 11, 1865.

86.—WILLIAM EDWARD GEDGE, "*Improved pincers for gas and other pipes.*" Jan. 11, 1865.

151.—JOHN WILLIAM GREGG, "*Improvements in street and other lamps and lanterns.*" Jan. 18, 1865.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

3193.—BENJAMIN NADAULT DE BUFFON, "*Improvements in apparatus for clarifying and purifying water and other liquids.*" Dec. 31, 1860.

14.—WILLIAM COLES FULLER, JAMES ARCHIBALD JAQUES, and JOHN AMERICUS FANSHAWE, "*Improvements in the adaptation of india-rubber and analogous gums and compounds thereof to valves, pump-buckets, packing, and other parts of steam, water, and gas engines and apparatus.*" Jan. 3, 1861.

56.—EDWARD CLARENCE SHEPARD, "*An improved apparatus for carburetting gas for gas lighting.*" Jan. 9, 1861.

82.—ALPHONSE RÉNÉ LE MIRE NORMANDY, "*Improvements in connecting gas and other pipes.*" Jan. 11, 1861.

Legal Intelligence.

THE DRAINAGE OF TUNBRIDGE WELLS.

On Thursday, Jan. 23, Mr. ARNOLD TAYLOR, the inspector appointed by the Home Secretary for the purpose, opened an inquiry at the Town-Hall, Tunbridge Wells, in pursuance of the provisions of the Local Government Act, 1858 (sec. 75), and of the Sewage Utilization Act, 1867 (sec. 4), and of a petition duly presented by the local board for the district, praying for "an inquiry with a view to obtain a provisional order conferring powers on the said local board to enable them to take land for the purpose of sewage irrigation," &c.

Mr. W. C. CRIPPS and Mr. W. P. TRUSTRAM appeared on behalf of the local board, in support of the petition; Mr. RENSHAW, instructed by Mr. Stephens, opposed on behalf of Mr. Julian Goldsmid, M.P.; Mr. T. F. SIMPSON appeared on behalf of Mr. John Heugh, a landowner; Mr. HOPWOOD on behalf of the Rev. W. Stephens; and Mr. SYDNEY ALLEYNE on behalf of the Dorking Charity Trustees and the Rev. J. J. Saint, of Groombridge.

The INSPECTOR commenced the proceedings by observing that he attended by direction of the Home Secretary, in consequence of a petition which had been addressed to him, praying for an inquiry as to a provisional order being obtained allowing them to take land for the purposes of irrigation and sewage, under the Lands Clauses Act, and also for making some further changes in the Water Act, and in the arrangement of the existing debt. His duty that day would be to take all evidence that might be tendered him on the subject by the respective parties, and the order of inquiry would be first to call upon the solicitors of the local board to give some formal proof of the service of notices of inquiry upon landowners, lessees, and occupiers of the land they proposed taking. He would then hear from the petitioners their case, and afterwards the case of the opponents.

Mr. CRIPPS then read the petition, which recited the proceedings of the local board consequent upon the action taken by Mr. Goldsmid in the Court of Chancery to prevent the pollution of the water of the lake in Somerhill Park by the discharge of the town sewage into the Calverley Brook. It then set forth the general features of the plan which was now to be investigated, and stated that the cost of forming the proposed sewage farm in the northern valley would be £24,360 12s. 6d., and in the southern valley £37,639 18s. 6d. These sums, with the estimated cost of certain necessary alterations of the sewers in the town and the attendant legal expenses, would make a total of about £70,000. The annual value of the premises assessable to the local rate was £106,000, and the present debt of the board £4465; and, in the opinion of the board, it was expedient that a period of fifty years should be allowed for the repayment of the money required for the purposes of the sewerage. The petition then prayed that a provisional order might be made, under the Local Government Act, 1858, as amended by the Sewage Utilization Act, 1867, to allow the local board to put in force, in reference to lands, buildings, and premises, the powers of the Lands Clauses Act, 1845, with respect to the purchase and taking of land otherwise than by agreement, for the purpose of the proposed sewerage works; that the Water Act, 1865, might be partially altered and amended by inserting a provision to extend the repayment of the money to be borrowed over a period of fifty years; and that, apart from or in addition to any money which, under the provisional order, 1867, the local board might have power to borrow on mortgage of the rates leviable by them under the local Act, power should be given them to borrow any sums of money not exceeding in the whole the amount of two years assessable value of the property within their district.

Mr. RENSHAW said the petition referred to a number of plans, and he, as representing Mr. Goldsmid, was desirous to see them. He had made an application with that object, and found that they were not at the place where they were said to be deposited. He asked that he might be supplied with copies of those plans.

The INSPECTOR said the Act of Parliament did not require that copies of the plans should be furnished.

Mr. CRIPPS said Mr. Goldsmid's surveyor had seen the plans at the office of Mr. Lawson.

Mr. HOPWOOD said he understood there were several persons present to object to the proposed scheme who did not appear by counsel, and, as *amicus curiæ*, he would suggest that an opportunity should be afforded to them to be heard.

The INSPECTOR explained that any ratepayer had a right to make his own statement at the proper time, but, of course, the right of examining and cross-examining witnesses would be confined to the legal gentlemen present. As the northern outfall was mentioned first in the petition, they had, perhaps, better discuss that first.

Mr. RENSHAW remarked that that was the only part in which he was interested.

Rev. J. J. SAINT said the question of the cost of the proposed scheme affected both the northern and the southern valleys, and, as far as he could judge from hearing the petition, the total expense had been very much underrated. He therefore submitted that the discussion of the estimates should take precedence of the inquiry into the merits of the plan.

The INSPECTOR said he did not think so, because the estimates were named separately.

Mr. HEUGH said the total cost appeared to be £70,000, but the cost of the land alone would be £62,000; there was, therefore, only £8000 for the execution of all the works.

The INSPECTOR said the inquiry must separate itself into certain parts, and he thought the more convenient course would be to take the opposition of the landowners and others first, and then the general merits of the scheme. A third subject for inquiry was the proposed change in the Water Act.

Rev. J. J. SAINT remarked that the difficulty which presented itself to his mind was, how the inspector could deal with these questions at all, the sum of money mentioned in the petition being so much under the amount really required.

The INSPECTOR said he presumed the learned gentleman who represented the local board would justify the estimates in his opening statement, and it would not be fair to hear objections until the case for the petition had been set up.

Mr. *John Elliott*, clerk to the local board, police-constable *Hobbs*, Mr. *J. G. Ash*, and Mr. *C. F. Rowe*, proved the serving of notices of inquiry under the 175th section of the Act, and the notice of the intention of the board to take land for sewage irrigation and for the easement of their pipes. Copies of the local newspapers, with the advertisements required by the Statute, were also put in.

Mr. CRIPPS said he had the honour to appear with his friend Mr. Trustram for the Improvement Commissioners, who constituted the local board of Tunbridge Wells, in support of the petition which had been presented by them to the Secretary of State, and it would be necessary that he should very shortly give a history of the circumstances under which it had become an absolute necessity for the local board to present that petition, which had resulted in the inquiry that was now to be entered upon The town of Tunbridge Wells had always been drained by means of two outfalls—one to the north and the other to the south. In consequence of the improvement, as it was called, in the system of drainage which had sprung up during the last few years, and which had been rendered necessary by the various enactments that had been passed, the brook called the Calverley Brook, on the north side, had received a large quantity of sewage which formerly did not drain into it. The brook had thus, to a certain extent, become fouled, and in the year 1864 Mr. Goldsmid, who was the owner of the Somerhill estate, filed a bill in Chancery to restrain the commissioners from discharging the sewage of the town into the brook, the effect of which discharge was not only to pollute the water in the farming part of his estate, but also the water in the ornamental lake in Somerhill Park. There was much scientific inquiry into the matter, and the cause came to a hearing in 1865; and in November of that year the Master of the Rolls made a decree restraining the commissioners from allowing their sewage matter to go into the brook, so as injuriously to affect the water as it flowed through the plaintiff's land. The commissioners, not feeling quite satisfied (and, in fact, the Master of the Rolls thought it was a case in which there would be an appeal from his decision), carried the question before the Lords Justices, who, after long argument and judgment reserved, came to the conclusion that Mr. Goldsmid had some ground for complaint, and they affirmed the decision of the court below. He (Mr. Cripps) should state that there had been a partial irrigation with sewage by Mr. Smith, who had used it on some land on the other side of the brook, but it was not quite sufficient, and did not get rid of the solid matter. Hence the complaint of Mr. Goldsmid. As soon as the injunction was granted the commissioners set to work to remedy the nuisance, and in the beginning of 1866 they called in Mr. Lawson, a gentleman who had had considerable experience in

matters of the kind, and instructed him to look at the whole subject, to examine the land on either side, and to report to them what, in his opinion, would be a scheme sufficient to get rid of the complaint of Mr. Goldsmid, and also effectually drain the district of Tunbridge Wells. He need not say it was a very important matter to the commissioners, and one attended with great expense. Mr. Lawson was instructed on the 22nd of January, 1866, and finding many difficulties to overcome, he was unable to make any report until the 18th of May in that year. The report which he then presented was an elaborate one, and a copy of it would be laid before the inspector. Having carefully considered the question, Mr. Lawson came to the conclusion that though he was anxious and desirous the land should be used both in the north and in the south valley, yet, looking to the probable future requirements of Tunbridge Wells, he believed, upon the whole, it would be advisable to divert the sewage from the northern outfall, and let it all go to the south. He felt great difficulty in the matter, for he was really proposing a scheme to take the drainage from its natural channel right away into another district; but, upon the whole, he came to the conclusion that that was the best thing to be done. The commissioners, of course, gave their anxious consideration to the matter, for they regarded it not only as a great scheme, but as one which involved a large outlay of money, and they knew they should have to encounter a most formidable, if not an overwhelming, opposition on the ground that Mr. Lawson proposed to take that portion of the sewage which naturally fell to the north in an entirely opposite direction. And not only so, but Mr. Lawson suggested that a tunnel under the town should be made, and the town was up in arms at the idea. The commissioners, therefore, asked Mr. Lawson again to give the matter his most careful consideration, and see whether it was not possible to obviate the necessity for the tunnel. Mr. Lawson did as he was requested, and in the result he reported verbally to the commissioners that taking all things into account, and in order that Mr. Goldsmid's opposition might be got rid of, he was able to provide an efficient system of drainage by still allowing the sewage to flow as heretofore, partly to the north and partly to the south. He was subsequently instructed to prepare the necessary plans for the purpose. He (Mr. Cripps) was very anxious to draw the attention of the inspector to the real position of the commissioners. They were pressed on the one hand with Chancery proceedings, although after a very hard fight the plaintiff was hardly able to show that they had inflicted upon him any nuisance. Mr. Goldsmid had proceeded even further than the injunction, for in the month of August last he obtained an order from the Master of the Rolls for a sequestration, on the ground that the commissioners had really done nothing to remedy the evil complained of, and in the month of November he put that sequestration in force, the result being that the money of the commissioners at their bankers was tied up; they could collect no rates, and they were now in a state of the utmost difficulty. It was perfectly plain that some scheme must at once be entered upon by the commissioners to clear their contempt of the Court of Chancery, and to remedy the nuisance of which Mr. Goldsmid complained. They had tried to get rid of the effect of the sequestration, and had been before the Master of the Rolls, who was of opinion that he could not withdraw it until after the present inquiry, and the Lord Chancellor was of the same opinion. He mentioned this to show how important it was for the local board that a favourable result should arise out of the investigation. According to Mr. Lawson's scheme it was proposed to take the northern sewage from the outfall by means of conduits along easements over land to a farm near Brook's mill, and the quantity of land wanted for irrigation purposes would be 138 acres—viz., 8 acres belonging to Mr. Smith, on the Colebrook Park estate; 39 acres and 23 perches belonging to the Rev. Mr. Stephens; 25 acres belonging to Mr. Edward Wickhams, and 65 acres of Mr. Goldsmid's land. The sewage on the south side would be taken from the outfall on to a farm of 169½ acres, consisting of 74 acres and 29 perches belonging to the Rev. J. J. Saint; 22 acres and 27 perches belonging to Lord Abergavenny; 63 acres 1 rood and 33 perches belong to Mr. George Field, of Ashurst Park; and 9 acres and 34 perches belonging to Mr. John Heugh. By this scheme Mr. Lawson was of opinion they would entirely get rid of Mr. Goldsmid's complaint, and establish a most effectual system of drainage for the whole town of Tunbridge Wells. The commissioners, taking all these matters into consideration, determined to apply to Parliament for an Act to enable them to carry out the scheme, but fortunately for this board and for all other boards throughout the country who had these extreme difficulties to contend with (for it was not simply the case of Tunbridge Wells, but of every town in which the common channels had been converted into sewers) the Government came to their rescue, and, on the 29th of August, 1867, they passed the Sewage Utilization Act, which gave the local authorities a power, which they did not possess before, to acquire land beyond their districts under the Lands Clauses Consolidation Act. The Government seemed to be of opinion—probably upon the report of the Rivers Pollution Commission—that irrigation was the best known system for the disposal and getting rid of the sewage of large towns. So that the board was fortunately in this position—that they could now, by a comparatively simple process, obtain the sanction of the Legislature to Mr. Lawson's scheme without having to resort to the expensive machinery of the Private Bill Office. He submitted, on the part of the local board, that they had done everything they could up to the present time to get rid of Mr. Goldsmid's complaint. They were now willing to spend a sum of £70,000 to effectually abate the nuisance and efficiently drain the town, for the accomplishment of which objects they earnestly hoped to obtain the sanction of the Secretary of State. He believed from the evidence to be produced the inspector would be of opinion that Mr. Lawson's scheme was a sound one, and one which the board would be justified, under all the circumstances and considering the pressure put upon them, in carrying into effect. There was, however, great opposition to them. One opponent was Mr. Goldsmid himself. Mr. Goldsmid had tied the commissioners by the leg, and then because, in order to get rid of his complaint, some land in his possession became necessary, he sought to stop their proceedings. On the one hand, he insisted that they should clean out the Calverley Brook; on the other, he refused to give them any facilities for the purpose, or to allow them to take any portion of his land. The scheme did not in any way affect the residential property of Mr. Goldsmid, and the nearest part of the proposed sewage farm would be 1½ mile from Somerhill Park. Of the nature of the opposition of the other gentlemen who now appeared he was not aware, but would have the opportunity of hearing it by-and-by. In conclusion he remarked that, if the present scheme, which adopted the natural outfalls, had been met by so much opposition, what might the commissioners not have expected had they resolved upon carrying out the original scheme, by which the sewage of the north was to be diverted into the southern valley.

John Lawson, Esq., examined by Mr. CRIPPS.

I have had considerable experience in carrying out sanitary works. In January, 1866, I was consulted by the Tunbridge Wells Commissioners with reference to what was to be done for the drainage of their district. I examined the land and made the necessary inquiries, and reported to them in May, 1866. [The report was put in.] The principle of that report was to divert the whole of the sewage into the southern valley. After that report was issued, I received further instructions from the commissioners, and I went over the land again. The result of my further investigations was the plans which are now before the inspector, and form the subject of this inquiry. The principle of the present scheme is to take a portion of land in the northern valley for the disposal of the northern sewage, and a portion of land in the southern valley for the disposal of the southern sewage. I have selected the land shown on the plan as suitable for the purpose of irrigation in both these valleys. We propose to take an easement along the district to the two farms. The scheme I have suggested, would in my opinion, cleanse the Calverley Brook, and get rid of Mr. Goldsmid's complaint, and it would enable us to deal with the sewage which at present flows into the northern valley, which includes nearly the whole of Tunbridge Wells. I have made an estimate of the cost of the works for carrying out the scheme. The cost of the works in the northern valley would be £7699, and in the southern valley £11,809, making a total of £19,508, to which I add 15 per cent. for contingencies £2991, making the total for works and engineering, £22,500. I have made an estimate of what it would cost to divert a portion of the sewage from the northern to the southern valley by sewers of an ordinary character, and find it would come to £2229 16s.

Mr. CRIPPS: What portion do you propose to divert from the north to the south? Is it sewage that must necessarily go to the north?

Witness: No, it is sewage which may be taken to either side. It is that which comes from property on the ridge of the hill, and at present goes into the northern valley; but it may without much expense be diverted, and may as fairly go in one direction as the other. In selecting these lands, in my opinion the farms would be suitable for the purpose of irrigation, and the quantity is sufficient for the purpose.

Cross-examined by Mr. RENSHAW: In the early part of 1866 I was consulted by the commissioners, and made a report upon the system which I then thought it was desirable to adopt with regard to the southern and northern outfalls. Previous to making that report I examined the course of the Calverley Brook and the land forming the valley.

Mr. RENSHAW: Did you at that time find there was sufficient land there for irrigation purposes—that is to say, to consume the sewage? It is right I should say that in your report I see this passage—"By constructing the outfall sewer at the highest possible level additional land may be irrigated by gravitation, but my examination convinces me that land sufficient in character and quality for irrigation cannot be found in the northern valley."

Witness: Yes.

Mr. RENSHAW: Have you seen reason to change your opinion?

Witness: I have. I find there is more land available, and the plan now proposed to be carried out does not deal with the whole of the northern sewage, therefore that remark is not applicable.

Mr. RENSHAW: What proportion does it deal with?

Witness: It deals with the sewage of a population of about 4000. The proposed works of deviation, which amount to £2229, take away a certain portion of the sewage from the north to the southern valley.

Cross-examination continued: I was subsequently consulted on several occasions by the commissioners, and I made a report to them on the temporary works necessary for mitigating the nuisance complained of by Mr. Goldsmid. At that time I had been supplied with some plans by Mr. Wright, the surveyor. I reported that the land I then examined was land almost surrounding Colebrook Park, and that, as a necessary consequence, its adaptation for sewage irrigation would necessitate the purchase of the mansion and ornamental grounds, or the payment, as compensation, of a sum almost eqnivalent to their purchase, and I stated that I should shrink from recommending the commissioners to adopt a plan of that kind. I stated that if a portion of the sewage was diverted from the north to the south valley, a certain quantity of land might be found for utilizing the sewage of the northern district. That expresses the view I still entertain. I thought that 130 acres could be obtained there for irrigation purposes, but then you will bear in mind that the land had the mansion upon it. I do not know what is the distance of the mansion from the brook; the ornamental land comes up to the brook. To the best of my recollection the land proposed to be taken was grass land, and I am not quite sure whether some of it was not in crop. On some parts of Mr. Smith's land there are carriers, and some of it has been irrigated. A portion of the land included in the 130 acres, I believe, is also under irrigation. I thought at the time it was well adapted for the purpose, and I think so still.

Mr. RENSHAW: Now, on the same page of your report I see this passage: "The land available as to level in the valley below Powder Mill Lane is, on the whole, too narrow, and is of too great a value to be suitable for sewage irrigation." Does that apply to the present site of your sewage farm?

Witness: Yes; and the same remark applies, to some extent, to the plan now before you. That land and other land below Powder Mill Lane is what is now proposed to be taken. The width of the valley, I find, varies. I am speaking of the width we can irrigate, for I must tell you that, since the report was prepared, I have had careful levels and sections taken of that ground, and, with that plan before me, I am better prepared to report than I was in 1866. I find that the breadth of the land we can irrigate from the carriers to be taken from the outfall sewer varies from 800 to 1300 feet.

Mr. RENSHAW: Is that mostly on the level?

Witness: No; there are slopes on each side. It includes the slopes, and includes some land in the valley which is better adapted for sewage irrigation.

Mr. RENSHAW: What is the breadth of the land? I suppose you had cross sections prepared.

Witness: I have no cross sections. I have a plan with contour lines upon it. The 800 feet and the 1300 feet are from the carrier on the one side to the carrier on the other. The banks are not very precipitous; they vary from 1 in 5 to 1 in 20.

Mr. RENSHAW: You do not consider that very well adapted for irrigation purposes?

Witness: It is not the best land for irrigation purposes unquestionably, but I have seen land with a slope of 1 in 9 belonging to the Duke of Portland, near Mansfield, where the operation of irrigation is very successful. The soil there is not better adapted for the purpose than this; it is a clay soil, very similar in character.

Mr. RENSHAW: Is that a water meadow, or is it irrigated with sewage?

Witness: It is irrigated by a stream which receives the sewage of Mans-

field in a similar way as the Calverley Brook receives the sewage of Tunbridge Wells.

Mr. RENSHAW: In the case you have just mentioned, the Mansfield sewage is a good deal diluted.

Witness: It was at the time I saw it; I do not know how it is in dry weather.

Mr. RENSHAW: Would that be so here? What I understand is that you take the sewage alone.

Witness: And the surface water, the subsoil water that falls on the northern side.

Mr. RENSHAW: The ordinary water of the brook will not be taken.

Witness: Yes, all that comes from the outfall sewer. The water of the brook below the outfall sewer may or may not be used for irrigation.

Mr. RENSHAW: Is that the best land, looking at it *per se*, that is, solely for irrigation purposes, that you could find?

Witness: No, I cannot say that, because I think there is land surrounding Mr. Smith's mansion more even in surface, and on that account better adapted for irrigation. I admit that the slopes of this land deteriorate from its value to that extent for the purpose, it would be folly on my part to dispute it; and if I could have got land of a more level character unquestionably I should have selected it, other things being equal.

Mr. RENSHAW: I suppose it would be an advantage to have the irrigation works as near to Tunbridge Wells as possible, so as to diminish the expense. What you propose is to carry the sewage a good deal beyond Mr. Smith's mansion.

Witness: Not very much beyond. The only additional expense is the length of the culvert. The distance from the land mentioned in my December report to the beginning of the land now proposed to be irrigated is about 70 chains (7 furlongs).

Mr. RENSHAW: With this rapid fall that you have spoken off—1 in 5 and 1 in 20—would it be probable that the sewage would be so completely purified as that none of it would get into the brook? Is it likely that the works would be sufficient to purify the water?

Witness: In my opinion it is likely, if the works are carried out, and the sewage is distributed and redistributed over the land, that it may go into the brook without causing a nuisance.

Mr. RENSHAW: Will that be so at all times?

Witness: In all ordinary times. In times of extraordinary rainfall it is possible some portion of the sewage may pass into the brook without going over the land, so as to be completely free from all solid matter; that I will not dispute, but at those times the sewage will be so much diluted that it might then go into the brook without nuisance.

Mr. RENSHAW: Then, in extraordinary times, the sewage would flow down the brook as it does now?

Witness: No, it would not. The sewage diverted by the intercepting sewer would be taken to the tanks, and, in addition to depositing there, arrangements would be made on the land for a further deposit. But I am not going to say that in extraordinary rainfall, when the intercepting sewer would not be sufficient to take the sewage, some portion may not get into the brook; but I say it will be so much diluted that, in my opinion, it will not create a nuisance. The outfall sewer is larger than the proposed intercepting sewer, and it will bring down in times of extraordinary rainfall a larger volume of sewage and surface water than the intercepting sewer will convey to the sewage farm. The excess will go into the brook, but I say that at such times it will be so much diluted with rain water that it will not lead to a case of nuisance.

Mr. RENSHAW: Would there not be a very great advantage in conveying the whole of the sewage in one tunnel in one direction?

Witness: I am afraid that is a question upon which there may be a very great difference of opinion. It is quite true that I recommended, in the first instance, that the whole of the sewage should be taken to the south, but I confess that I had very great doubts in my own mind as to the fairness of such a proceeding. I think it is only right that the sewage of the north should be dealt with in the northern valley, and the sewage of the south in the southern valley.

Cross-examination continued: There would be the advantage of having only one sewer, but to take the whole of the sewage to the south would involve the expense of a tunnel under the town, and it would require a somewhat larger conduit to take the combined sewage. There are other considerations besides those of expense, though the cost of a tunnel through the town would be more than the saving effected in having only one sewer. It would be possible to convey the combined sewage in an iron pipe, but that would be still more costly. I have considered the proposal to convey the sewage of the north side through the railway tunnel, and no doubt it may be done; but there again is the question of obtaining the sanction of the railway company, the cost of the work, the possible and probable danger to the railway, and other matters which require to be taken into account. If carried through that tunnel it would not be necessary to go many feet below the present level. I know that an application has been made to the railway company to allow the work to be done, but they object to it, and very properly too. It is feasible as an engineering work. In laying out the plan for my sewage farm I have taken into consideration the growth of the town on the north side, and have made ample provision for it. So far as I can ascertain from those who are better able to judge, there is no such probable increase in that valley. I think the irrigation of the 138 acres would be sufficient to purify the sewage of the northern portion of the town, even if, during the next 10 or 20 years, the population should increase to 6000. As to the general quality of the land, I should say that the land we propose to take and that belonging to Mr. Smith is similar, but the inclines on Mr. Smith's land are more gentle. It does not necessarily follow that because Mr. Smith's land is nearer the town that it is better adapted for irrigation purposes. If the town is expected to increase greatly, I should say it is better to have the works at a distance; and then, again, the cost of the land will be less. I can scarcely answer the question as to how often the tanks which would be on the farm would require to be emptied, because it would depend upon the quantity of solid matter brought down. I have no plan of dealing with them beyond this—that in those tanks a quantity of solid matter will be deposited, and there will be gratings to allow of the liquid matter running off. The solid matter may be applied on the farm itself, or it may be sold

By Mr. HOPWOOD: As a plan for removing the sewage of Tunbridge Wells further from the town, my original plan was better than the present. From the valuation of the land, which has been made not by myself but by another person, I believe the cost of carrying out that plan would have been greater, and in that respect not so desirable as the present. One reason why I should prefer it is that the land in the southern valley is better adapted on account of its levels for the reception of sewage than the land in the northern valley. For that reason I think the original plan was to be preferred. The two schemes are about on an equality, so far as regards the irrigation being carried on near a town population. My first scheme did not fix upon any particular land below Groombridge, and there was no specific area pointed out, therefore I cannot tell what the population near to it would be. It is not a populous district, nor is the northern valley in which the land is now proposed to be taken a populous district within a radius of half a mile of the farm. The site now proposed in the southern valley is not the same as that referred to in my first report. The nearest point of the land then suggested as suitable for irrigation purposes was half a mile below the present site. My first report embodied no estimate, and until it was thought desirable to compare the cost of the present scheme with the original one, I had not made an estimate of the first cost. I then found that, including the tunnel and the works in the town, it would amount to £38,200. That sum included the cost of the tunnel through the town, the outfall sewer from the mouth of that tunnel to the land proposed to be irrigated, the works on the farm, and in fact everything estimated for in connexion with the present scheme. I did not touch upon the value of the land nor the easements in either case. I believe about £13,000 in round numbers is the difference by which the first scheme exceeded in cost the present scheme. I cannot say in what form the objection of the commissioners to the first scheme was conveyed to me.

Mr. CRIPPS objected to the question, and said the learned counsel had no right to endeavour to ascertain what had taken place privately between Mr. Lawson and his clients.

The INSPECTOR said the question put by the learned counsel had certainly nothing to do with the northern outfall.

Cross-examination continued: At present the main sewer on the northern side flows into the Calverley Brook. I do not propose to alter or enlarge the sewers in the town. At the point where the present sewer becomes an open drain I propose to construct an intercepting sewer, with a small gradient to convey the sewage, by a somewhat shorter course than the brook itself, on to the land intended to be purchased. It will there be received into one or both of two tanks placed at the same elevation. I cannot form an idea as to how often those tanks will require cleansing; it will depend upon the weather and other circumstances. In wet weather probably a larger amount of solid matter will be brought down than in dry, and then the tanks will require to be emptied oftener. It would be a mere guess if I were to say how much would probably be brought down. The sewage will deposit in the tanks a portion of the solid matter held in suspension, and the liquid matter will flow over and be used for irrigation, being conveyed by carriers on to the land. All the liquid which flows over the carriers must flow into the brook. It is not necessary that the land should be absorbent for the purpose of irrigation; the soil at Norwood, where the operation is carried on, is not absorbent. Beyond certain limits the inclination of land makes it less desirable for sewage irrigation. Some of this land is beyond that limit so far as this, that, for the purification of a certain quantity of sewage, it will be necessary to use a greater quantity of land. The levels on the contour plan have been taken since my December report was prepared. It was necessary to take them for the purpose of showing the line of the intended carriers. I had all the other elements before me for deciding upon this scheme when I made my report. In the case of Mansfield the stream, when I saw it, was a very considerable one, but I did not gauge it. I should think it was larger than the Calverley Brook. The land there is clay, and the inclinations 1 in 9. That is what I have read in a report descriptive of the works, and, from walking over the ground, I should think that is the average. The tanks which I propose to construct will be open. There might be a smell from them at a quarter of a mile distance, but not probably beyond that. I cannot say how many cubic feet of stuff one of these tanks would hold. The size of the tank shown on the plan is 150 feet long, something approaching 16 feet wide at the top, and about 3 feet deep; but I may tell you that the detail drawings of the tanks are not prepared. They will have brick sloping sides and brick bottoms, the object of the tanks being to intercept such floating and solid matters as it is desirable should not flow into the open trenches for irrigation. The solid matter may be either used upon the land or sold. The distance from the centre of the farm to the road leading from Tunbridge to Tunbridge Wells is about three-quarters of a mile. There are several houses along that road. I have not taken the pains to ascertain the population of Southborough.

The INSPECTOR: Are you aware that there is a partial system of sewage irrigation in operation at Southborough?

Witness: I do not know anything of Southborough.

Mr. ALLEYNE: On behalf of the Dorking Charity Trustees, I should like to ask what the depth of the sewer passing through their land would be.

Mr. LAWSON: On one part of the property the minimum depth would be 6 feet, while in another portion, with the exception of the crossing of some small brooks, it would be 8 feet.

Mr. ALLEYNE: Would it, in your opinion, be prejudicial to the cultivation of the land?

Mr. LAWSON: Not at all; but, if it were, it would be a question for compensation.

Re-examined by Mr. CRIPPS: Having taken all the circumstances into consideration in connexion with the northern valley, I could not as an engineer recommend the commissioners to take the Great Lodge estate. In the case of storm overflow there would not be such a flow of sewage into the brook as would injuriously affect Mr. Goldsmid's land. I have had considerable experience in carrying out sewage schemes and in the construction of sewage tanks. In some cases the tanks are covered; in others they are open. Having regard to the position in which these tanks will be placed, I think they will not be a nuisance if left open, and I should advise the board to leave them open. Judging from the distance and the position of the tanks, I should certainly say that no nuisance would arise from them to the inhabitants of Southborough.

The INSPECTOR said he understood there was an important witness for Mr. Goldsmid present, who would not be able to attend on the following day, and he proposed to have him now examined.

Mr. *Bailey Denton*, examined by Mr. RENSHAW.

I am a civil engineer, and have been for the last 20 years the engineer of the General Land Drainage Company. I have also been engaged in other similar capacities. I have been acquainted with the Somerhill property for many years. It consists of between 4000 and 5000 acres. I have seen the land belonging to Mr. Goldsmid which is proposed to be taken on the present occasion for the sewage farm. It consists of upwards of 65 acres, and forms part of the total of 138 acres. It is the Moate farm. I could hardly call it building land, but such is the rapid progress of building in this district that all the land between Tunbridge and Tunbridge Wells has a value beyond its simple agricultural value; in fact, I should say so of all land within a radius of the same distance from Tunbridge Wells. It forms a very pretty valley; the land is undulating, and has a prepossessing character, being nicely timbered. It is within a mile of Somerhill Park. The

distance as the crow flies would be a mile and a quarter from the mansion to the centre of the sewage farm. I cannot call it clay land; it is a loam upon a friable subsoil. I do not think it is unsuitable for irrigation. It is not the best, nor is it the worst for the purpose; but, with regard to undulation, I use, perhaps, an extravagant term in saying that the precipitous character of the land is such as entirely to disqualify it for sewage irrigation, though not for water irrigation. Perhaps a system such as is carried on in the West of England would be applicable for water here, but not for sewage. I think Mr. Lawson would very much regret, if he should be successful in obtaining the adoption of his plan, that he had applied it here. I never saw land more unsuitable, and I perfectly agree with Mr. Lawson in his first report, supported and confirmed as it is by his second report.

Mr. RENSHAW: When you say "unsuitable" you have reference to the breadth of the valley and the steepness of the sides?

Witness: Exactly so; the narrowness of the flat or bottom of the valley, and the precipitous fall of the slopes. Taking Mr. Lawson's own figures of 1 in 5, I believe that inclination to be an utter disqualification of the land for the purpose to which he proposes to apply it. I think the widest part of the flat of the valley is not more than six or seven chains. The sides of the valley generally approach one another within a chain or two. The rapid slope of the sides is such that in times of storm or excess of sewage it is utterly impossible but that some of the sewage must reach the brook—I do not say how much—however carefully the works are conducted; and if, in addition to that, it is, as Mr. Lawson explains, that the storm water or surface water be allowed to run down the brook without passing over the land at all, those two circumstances cannot fail to make the brook a nuisance at times. The vegetation and the land together will not be able to appropriate the sewage. Mr. Lawson has very fairly spoken of the sewage work at Great Lodge, as it is now carried on. Comparing the intended sewage farm with that which is now in operation, where a nuisance does exist, the fact of the sewage being applied one mile or more nearer to Mr. Goldsmid, whereby the benefit of oxidation is reduced, the result to Mr. Goldsmid may be—I do not say positively it will be, but it is a strong opinion on my mind—that it will be a nuisance also. The distance from the land proposed to be irrigated to the lake in Somerhill Park is 67 chains. Comparing this with the nearest point at which the sewage is now discharged at Colebrook, the difference is 120 chains, the latter being 178 chains from Somerhill Lake; so that this will be 1½ mile nearer. I know the irrigation works at Great Lodge; they extend from the brook to the gardens of Colebrook House. The irrigated meadow nearest to Colebrook House, I believe, bounds the garden or pleasure-ground. A branch of the brook runs at the bottom of the pleasure-ground, which does not receive any sewage. What I have to say has a very great bearing upon what I have heard to-day. Mr. Lawson said he thought there would be a great objection to the taking of sewage on to the Colebrook estate, because of the prejudice as to the nuisance which he thought would exist, and which would render it necessary to buy the whole estate. Now, it is a fact that the existing sewage is as near to the house at Colebrook as it can possibly be.

Mr. SIMPSON: And it is a fact that it is a great nuisance.

Witness: But Mr. Smith, the owner, is the person applying it.

Examination continued: I cannot say that there is abundance of land on the Colebrook estate for the purpose of irrigation, but Mr. Lawson's report states that there are 130 acres fit for the purpose. I should say that there is enough land on the estate, and that estate has been in the market for sale. That land is as perfectly well suited for the purpose as is to be found in the neighbourhood. It would have this advantage, as far as Mr. Goldsmid is concerned, that there would be a greater length of the brook for the effluent sewage to pass over before reaching Somerhill Park. Without saying that there would then be no nuisance, I believe this would go far to abate it. I do not believe in the offensive character of sewage as many people do. But prejudice has a money value. I should be very sorry if my wife were an invalid to take her to the place. In the cleansing of the tanks there would be an aggravation of the nuisance; still I do not believe the question of smell is so important in any way compared with the pollution of the water. You will find persons who do not care about smells come and live near sewage irrigated land.

Mr. RENSHAW: While those who drink the waters die.

Witness: There is a very great objection to polluted water. I believe under certain states of the atmosphere the smell of the sewage may reach for miles, but I am not prepared to say it would be unhealthy.

The INSPECTOR: Do you say that with regard to sewage coming in fresh and fresh?

Witness: I visited a farm last summer, and I must say my nose was not satisfied. It was the Barking farm, which is being successfully conducted upon the best plan, and there the smell was decidedly perceptible at some little distance off.

Examination continued: Under certain states of the atmosphere, and with the prevalent south-west wind, I quite believe the smell would reach from the intended sewage land to Tunbridge or Somerhill House. The sewage would run off this land very rapidly. In water irrigation it is necessary that the water should run at a certain rate. Mr. Lawson referred to the Clipstone irrigation works, watered by the river Maune. I say that there is no ground of comparison between the two cases. I know this land and I know Clipstone intimately, and I know the circumstances of the irrigation very well. I know there is no analogy between the two cases. The sewage at Mansfield is highly diluted; in this case the object is to reduce the liquid to a minimum. At Mansfield they are carrying on with that highly diluted sewage a system very much approved in the West of England, called the catch water irrigation system, and it is very successful; but in this case, although the sewage you are dealing with may be diluted, it will still be sewage only. I have seen the land on the south first proposed by Mr. Lawson, and I consider that that land is very much more suitable for irrigation than the land now proposed.

Mr. RENSHAW: I suppose there are times when the land would not be in irrigation—it would be in crop.

Witness: Mr. Lawson has taken enough land to carry on the irrigation all the year round, if the precipitous character of the slopes does not frustrate that intention, which I think it will. If the land is applied to Italian rye grass, every third year it must be broken up, and cultivated with some crop which will not require such treatment. I therefore suppose he has provided for having the land at times in a state of rest—*qua* sewage.

Examination continued: I do not think frost will interfere with the application of sewage; it is possible it may do so. I speak practically and after some reflection, when I say that the land now selected is not proper land for the purpose, and that there does exist the land I have spoken of which is appropriate, and that is land more to the south—nearer Tunbridge Wells and further from Mr. Goldsmid, which it ought to be. Considering that it is physically impossible to carry out the sewage works, as designed by Mr. Lawson, without occasional nuisance over which he nor any one else can have any control, it must be right to put the sewage farm as far as possible from Somerhill.

Mr. RENSHAW: The town would like to get it as far away from them as possible.

Witness: Yes, but they are the creators of the nuisance.

Examination continued: I have made myself acquainted with the character of the land in the southern valley for this purpose, and I heard what Mr. Lawson said about the scheme. As an engineer I thought it was a feasible plan. Mr. Lawson called upon me respecting it, and though I did not then presume to give him an opinion, I give it now—that that scheme of his was the scheme to be carried out. Looking to the future working of the whole concern, it would be better to have one establishment instead of two. I do not give this as my opinion alone. Mr. Grantham is here, and he is of opinion that the southern culvert is large enough to carry the sewage of the whole town. I should put the land there on a par with Mr. Smith's land on the north side, but it is of larger extent. The process of irrigation may go on almost without limit. I believe there is plenty of land in that valley for the united sewage. Mr. Bazalgette has given an opinion to the effect that a pipe might be laid down in the railway tunnel, and I should say, looking at it cursorily, that it may be done. An iron pipe carried through the tunnel, immediately below the sleepers, would effect the object in a ready way. I do not believe it would produce any more effect upon the springs in the town than the tunnel itself. Mr. Goldsmid looks to Somerhill as a place of enjoyment, and, if Mr. Lawson's present scheme is carried out, even in the best method, it will cease to be so because of the occasional nuisance. From the present outfall sewer on the north the sewage might be pumped up on to free soil at an elevation of some 150 to 200 feet above the mouth of the sewer, and could be really beneficially applied, as far as the land is concerned and as far as the springs go, for the sewage water would penetrate through a sufficient depth of ground to purify it. It could be lifted to land on the Sandown estate, or in that neighbourhood, between the water company's new reservoir and the union workhouse. It is land which would quickly absorb the sewage, and the effluent water would percolate through the soil, and be emitted again for the supply of Tunbridge Wells with water.

Mr. RENSHAW: They would rather our neighbours had it.

Witness: Would you allow me, as my remark has created a smile, to say emphatically that it is a plan which might be carried out, and I put it before every one in this room who is able to judge, without fear of contradiction. It is to be presumed that the water would be perfectly pure when it reached the springs 150 feet below. There is a plan by which the sewer might be tapped at the northern outfall, and the unmitigated sewage carried by a conduit, past Somerhill, into the Medway Valley below Tunbridge. I think that is a feasible plan. The present proposed plan is the worst of all, and the Tunbridge Wells people will some day acknowledge it if it is carried out.

By Mr. SIMPSON: I should stultify the opinion I have written and expressed if I did not say that to carry the sewage from the northern to the southern valley was not against the fundamental principle that ought to prevail. At the same time let me say as emphatically as I can that, all things considered, it is, in the present case, the best thing that Tunbridge Wells can do; and it is a plan which would satisfy Mr. Goldsmid—and he has a very strong opinion upon the subject.

By Mr. ALLEYNE: I do not think that the application of sewage is really detrimental to health; but, as far as nose and smell are concerned, it is certainly not desirable. The inhabitants of the village of Groombridge are undoubtedly as sensitive in their olfactory nerves as Mr. Goldsmid. There is not, I imagine, so much residential interference in the southern valley as in the northern one. There are always objections to such propositions as these, but, looking to all the circumstances, I think the objections are less in the south than in the north.

Cross-examined by Mr. CRIPPS: I have not considered any plan as feasible for diverting the sewage of the south to the north, because we do not usually carry sewage up hill. I cannot say for myself what the difference of the level is, but I take Mr. Lawson's or Mr. Bazalgette's statement that there is a 10 feet fall in the railway tunnel from the north to the south side. I have no doubt the South-Eastern Railway Company would be amenable to the compulsory powers given by the Legislature in the same way as other people are, and allow the pipe to be carried through the tunnel. I do not know that I should take the same view that Mr. Goldsmid does on this subject. The prejudices which people have to the application of sewage in the neighbourhood of their residences is so great as to deteriorate the value of property considerably. My personal view is that there is not much real injury done, but the prejudice is so great that it operates as if there were. I have experienced the smell from the brook as it enters the Somerhill Lake at the present time. The site of the proposed sewage farm is so unsuitable that really, if I wished to find a reason for its adoption, I should fancy the town of Tunbridge Wells was taking the sewage nearer to Mr. Goldsmid to annoy him. There are other places which might be selected equally good as those I have mentioned, if the sewage were lifted on to higher ground, but the Tunbridge Wells people are saving themselves money by taking the sewage away by gravitation. I am not, at the present moment, able to point out any other high land suitable for irrigation purposes except Sandown. I am aware that that estate is laid out for building, and if you wait a few more years the site you have selected will be let out in the same way. It is of that picturesque character that is prospectively of much more value for building purposes than mere agricultural land.

Mr. CRIPPS: That is a question of compensation.

Witness: The question of compensation will come very prominently before you if this inquiry should end in your taking Mr. Goldsmid's property, as to consequential damage. I should propose to lift all the northern sewage as the best prevention to pollution. Taking the population of the north side at 4000, and multiplying that number by 30, you will get the number of gallons that would have to be lifted per diem. That is exclusive of rainfall, which I cannot calculate without knowing the areas.

Mr. CRIPPS: In opposition to your practice, and to your opinion that the sewage should always flow in its natural channels, you would prefer taking the sewage of the north into the southern valley.

Witness: Yes. There is no rule without an exception, and this is an exceptional case.

Cross-examination continued: To take the sewage below Tunbridge would not interfere with or add to the difficulties of that town. I dare say the Medway Company would not be willing to take it. I am aware that that land is liable to be flooded, but engineering skill could get over that. I do not advocate that plan, I only say it is feasible.

Mr. CRIPPS: All your plans have reference to getting rid of the nuisance to Mr. Goldsmid.

Witness: Mr. Goldsmid is my client; but I may say in qualification of that, that I conscientiously believe the best thing that Tunbridge Wells could do would be not to inflict a nuisance on Mr. Goldsmid.

Cross-examination continued: With reference to having only one sewage farm, I may remark that the first cost and future maintenance would be less than with two, and all concentrated labour is better. As far as the town is concerned it would be an advantage to have two markets for crops. I am not an advocate against the application of sewage; quite the contrary. I have accepted the position of engineer to the Sewage Utilization Company. When I smelt the sewage at Barking, I cannot say how near I was to the land. I was close to it. That was one objection, and another was that the wells within the farm were affected. As I retired from the farm I exerted my nostrils to their full capability, and I did perceive the smell at some slight distance from the farm.

By the INSPECTOR: I asked Mr. Morton, the manager of the farm, whether the wells were affected. He said they had perceived an effect in the shallow wells. But there the ground is flat, very porous, and absorbs the sewage freely. Of course, with deeper wells there is more chance of the water being pure.

Edward Ryde, Esq., examined by Mr. CRIPPS.

I am the surveyor of the South-Eastern Railway Company, and have had considerable experience in valuing land. I have bought and sold land very extensively under compulsory powers. I have examined the plans proposed by Mr. Lawson, and have been over the ground to be taken for irrigation purposes in the northern and southern valleys. I have made an estimate of the probable cost to the local board of the sewage farm in the northern valley with the easement to it, and have fixed the sum at £15,500. I have also made an estimate of the land required for the sewage farm in the south, with the easement, and find it amounts to £24,000. Certain land has been pointed out to me below Groombridge, in the Hartfield Valley, which could be made available for irrigation purposes, the quantity of which is 226a. 1r. 26p. I have been over that land, and have made an estimate of the cost to the board to purchase the land, and the expense of the tunnel under the town, and of the easements, and find it would be £40,000. This would not include the cost of the works; it is the money value of the land.

The INSPECTOR: Mr. Lawson's estimate of the engineering works for the same scheme was £38,200.

Examination continued: The quantity of land required in the present plan is 188a. 0r. 7p. on the north, and 169a. 2r. 3p. on the south side. That is an excess of about 80 acres over the Hartfield Valley scheme.

By Mr. HOPWOOD: In the interest of those for whom I made this estimate I think I ought not to say what sum I put down for the easement and what for the land. I have looked at every landowner's case by itself, and the sums which I have put down are such as, upon a balance of probabilities, we may reasonably expect to buy the land for under compulsory powers. I have considered the case of a landowner who may have a portion only of his land taken, and the sum which, before an arbitrator or a jury, he would probably get for consequential damage to the remainder. If there were a good dwelling-house upon it, I should have considered whether he could claim anything on account of the smell, but there is no such dwelling-house. I have not put this land at the value I should have done had it been purely agricultural land, miles away. I have allowed a dormant value in the land.

By Mr. SIMPSON: There are many reasons why I should not tell you what the cost would be of taking the sewage lower down the valley, as I should have to make a fresh estimate. I decline, in the interest of my clients, to tell you what the expense will be of carrying the sewage lower down the Hartfield Valley, excluding the tunnel.

The INSPECTOR said he thought the witness was quite right in his answers, for if the learned counsel got what he asked he would soon get out all the rest.

Cross-examined by Mr. SIMPSON: The land lower down the valley, below Groombridge, would be cheaper than that which is to be taken. The land I have valued as the site for the tanks is unsuitable for building purposes. I should say the man was mad who talked about erecting a villa on the ground marked on the plan for the sewage-tanks. There are villas erected on the higher ground, but I do not think there are any very pretty villas there. The villas there are on high ground, thoroughly out of the way of the smell and sight of the proposed sewage irrigation works. I have no hesitation in saying that there will not be any residential damage. I do not believe that the smell from these sewage farms will travel as far as Mr. Bailey Denton has stated. I will give you my own experience. Take, for instance, Croydon, where the freeholder of the sewage farm asked me to send him a purchaser, and I sent him several. Houses have been erected there, in the middle of the sewage, and have been let. I cannot say the exact distance the works are from the houses. Some of the land in the south valley is used for hop growing.

By Mr. ALLEYNE: In making my estimates I take the intrinsic value of the land, the consequential damage, and the compensation for forced sale, into consideration, and in this case there is a tenant's interest. I have considered the effect of these works upon Mr. Saint's residence. I consider his is an exceptional case. But it should be remembered that Mr. Saint has now all the sewage of Tunbridge Wells flowing past him, and that when this plan is carried out he will only have that which goes to the farm. I think he will have a claim for his land, and for consequential damage. The effect of these works will not render the house uninhabitable.

Mr. SIMPSON: I am instructed to ask for an adjournment of the inquiry for a month.

The INSPECTOR: I certainly shall not grant that.

Mr. SIMPSON: The grounds on which I found my application are that the commissioners have now had nearly two years in which to prepare their plans, &c., whereas we have only had a month's notice respecting this inquiry.

The INSPECTOR: If the application were granted it would virtually throw the commissioners over until the next session. My time is valuable, as I have a certain amount of work to get through, and I cannot adjourn the inquiry. We will, therefore, meet, gentlemen, to-morrow morning at half-past eleven o'clock, but we must sit until six.

FRIDAY, JAN. 24.

Mr. SIMPSON stated that in consequence of his application for an adjournment of the inquiry for a month having been refused, he was instructed by his client (Mr. Heugh) to withdraw from his opposition to the scheme at that stage; but he should reserve to himself the right of opposing it at another stage.

Mr. *Ryde* was recalled, and further examined by Mr. ALLEYNE. He stated that he had never experienced any smell from sewage irrigation works at a quarter of a mile distance. He thought in this case Mr. Saint had a stronger claim for consequential damage than anybody else. With reference to Mr. Field's property, he had spots on his estate suitable for building purposes, and of course, if Mr. Field could show that his land suffered in value from the sewage being carried through or near it, he would be entitled to compensation. He considered the average price of land in that part to be, including severance and consequential damage, £150 to £200 per acre, and not more. With reference to the cost of executing the works, he could not say anything, but as regarded the land he considered that the £24,000 was amply sufficient, considering everything, to pay for the land required in the southern valley.

Mr. RENSHAW said he had the honour to appear for Mr. Goldsmid, whose position in relation to this matter was very peculiar. He was not only a landowner, but a landowner hedged round by protected rights. He had got a decision of the court in his favour, and the inspector, in dealing with this case, must have regard to the position of Mr. Goldsmid in this respect. Mr. Goldsmid was the proprietor of a very valuable estate, containing upwards of 4000 acres, and there were historical associations connected with it which tended to enhance its value. The Somerhill estate was once the property of Queen Elizabeth, and from that time to the present it had been inhabited by persons of importance. Under the old parliamentary system the possession of this estate gave considerable local influence to its proprietor. His rights there were very valuable to him, and the damage done by the proposed works might prevent his residing there. Mr. Goldsmid's predecessor filed a bill in 1864 to restrain the commissioners from inflicting upon him a nuisance. The commissioners, in respect of the powers vested in them, constructed a system of sewerage which greatly increased the quantity of sewage passing into the Calverley stream, the effect of which was to give rise to serious grounds of complaint, because the sewage from the brook found its way into an ornamental lake of four or five acres in extent situate in his park, and polluted the water, which had been occasionally used by the cottagers on the estate for drinking purposes, to such an extent that even the cattle refused to take it, and there was some evidence that the fish in the lake had died. The Master of the Rolls granted an injunction restraining the commissioners from allowing matters from the town of Tunbridge Wells being discharged into the stream in such a manner as to affect the water of the brook as it flowed through the plaintiff's land. Mr. Goldsmid and his predecessor had acted throughout on purely defensive grounds. They were in duty bound—in duty to themselves and their tenants—to enforce to the utmost these proceedings. No doubt the commissioners had difficulties to contend with, but Mr. Goldsmid had given them ample time to complete arrangements for abating the nuisance. Great delay had taken place, the commissioners having appealed to the Lords Justices against the decree of the Master of the Rolls, but he submitted that now Mr. Goldsmid's rights had been solemnly adjudicated upon, the inspector must see that nothing in the plans about to be carried out under the provisional order should be allowed to override the decision of the Court of Chancery. No doubt there was very considerable pressure at the present moment upon the commissioners. Something would have to be done, and therefore he felt very great reluctance in opposing any practical plan that could be adopted. But he would submit, from the evidence given on the previous day, that a better and a less expensive plan could be adopted by the town. He did not go into the matter of expense, for it seemed to him to be utterly immaterial to the point, although it might certainly be material to the ratepayers. The question of expense was not to be weighed for one moment against the absolute right of Mr. Goldsmid to prevent the sewage passing into his brook. It seemed to him, from the evidence of Mr. Bailey Denton, that the land on the Great Lodge estate, which was now in the market, was the most suitable land for irrigation; and, in fact, Mr. Lawson was in favour of that opinion, but he abandoned it on the score of expense, the difficulty being the mansion. But, then, there was no more occasion to consider that mansion than the one at Somerhill. Great Lodge might be purchased by the commissioners, and sold again by them; it might be at a loss, but then that should be borne by the town—the aggressor. One of the witnesses had referred to the houses built on the Croydon farm, but it was a very different thing to go to a nuisance and to have a nuisance brought to them. No doubt those houses were let at a very low rate.

The INSPECTOR said he happened to know those houses, and to know that such was not the case, for they were let at a very high rent.

Mr. RENSHAW remarked that it might be they would have commanded a still higher rent but for the sewage works. He wished to call the attention of the inspector to the 5th section of the Sewage Utilization Act, 1867, to show that whatever works were carried out under the provisions of that Act must be done so as effectually to prevent nuisance. The Legislature had most strictly provided against the contamination of the streams. The main point for consideration in any plan proposed was to see that it was thoroughly efficient for the purpose, so as to prevent nuisance. On every ground he objected to Mr. Goldsmid's 65 acres being comprised in the proposed sewage farm, when it was clear that there was other land nearer the town which could be obtained for the purpose. The only reason why that was not taken was, that it would involve additional expense; and he submitted that that was not a sufficient ground to prevent the work being carried out there.

Dr. *Voelcker*, examined by Mr. RENSHAW.

I am professor of chemistry to the Royal Agricultural Society of England. I know the Calverley Brook, and have been all along its course—from the sewer outlet down to the Priary Mill—on several occasions. I know the land proposed to be taken for a sewage farm below Powder Mill Lane. The soil is well adapted for sewage irrigation, but the position of the land I conceive is far too precipitous for that purpose, though not for water irrigation—at least, the greater portion of it. In order to irrigate land profitably, which of course a farmer would wish to do, he would have to soak, as it were, his land with sewage; in other words, he must use a very great excess of sewage, so as to saturate the land to a great extent, and fill it with fertilizing matter, which can afterwards be appropriated by the plants growing upon it. In a great measure it would depend upon the character of the soil whether the sewage water brought over the land would be purified. I do not know of any instance in which filtration through the soil has perfectly purified the water after being once passed through it. It is necessary to let it pass repeatedly through new portions of soil in succession before you could safely let it pass away, so as not to become a nuisance in the water-courses. There would be a very great difficulty in doing it here, as the gradients are very steep. For this reason engineers properly select land with very moderate falls for sewage irrigation, so that the water flows very gradually, not over but through the soil. In July last I looked at the sewage works at Bury St. Edmund's. The sewage is there collected in a large filtering-tank, about a quarter of a mile distant from

the outskirts of the town. In this tank the sedimentary matter is allowed to deposit, and the comparatively clear water is then pumped up to the highest part of the field, at the distance of, perhaps, another quarter of a mile from the settling-tank. The water is allowed to flow over tolerably level ground, or ground with moderate inclinations. It takes about two days to saturate a quarter of an acre. I do not know the population of the place. The field I saw under treatment was a 40-acre field growing Italian rye grass and saintfoin, and it took about two days to complete the irrigation of each quarter of an acre.

The INSPECTOR: Dr. Voelcker will no doubt tell the other side that this is a wholly exceptional mode of dealing with the sewage.

Witness: It struck me at the time that they had far too much land at their disposal.

The INSPECTOR: I only want to get it correctly in my notes. I am quite right in taking it that way?

Witness: Quite so. I do not say I approve of the plan; I only state the fact.

By Mr. RENSHAW: I do not consider the land proposed to be taken, if heavily irrigated, will completely purify the sewage; chiefly on account of the inclination of the land. It would flow over it, instead of filling it and filtering slowly through it. The depositing-tanks would certainly help to clarify the sewage. Without these settling-tanks you could not practise sewage irrigation; but there would be a difficulty in disposing of the sedimentary matter, and its removal would be a nuisance in itself. They would require to be emptied perhaps once a fortnight, or more frequently, and at those times there would, no doubt, be a disagreeable smell. It would depend a great deal upon the prevailing wind and the dryness of the atmosphere as to the distance at which the smell would be perceived. I have stood as near as 20 yards from such tanks and hardly experienced any disagreeable smell, and I have been as far off as a mile and a quarter and have perceived it; with a south westerly wind and a muggy atmosphere, saturated with moisture, you can smell sewage matters a long way off. I have no doubt that, in such circumstances, the smell would reach Somerhill. In ordinary cases a great deal of sewage would still go into the stream; and, on occasions of heavy rains, a large quantity of sewage would flow down unpurified by passing through the ground at all.

Cross-examined by Mr. CRIPPS: I cannot say how much of the land proposed to be taken is too precipitous for sewage irrigation. I have not surveyed it in any way. I have examined it on three different occasions; the last time was in May, 1866. I was not aware at the time that the commissioners proposed to take that land for the purpose; in fact, I was not aware they intended to irrigate at all until about a fortnight ago. I cannot point out on the plan the portion of the proposed sewage farm which I consider too precipitous. My opinion is formed upon the general impression I had at the time I examined the land. In order to make sewage irrigation profitable, the soil should be saturated with it; and, for the purpose of clarifying the sewage, it is necessary to use it over several portions of land. There would be some difficulty in irrigating perfectly flat land; slight inclinations are very favourable for the purpose. If the sewage is kept from running off too rapidly, there is an advantage in the land being somewhat irregular; but if the irregularities are so great that there is no means of retaining the sewage for some time on the land, there would be a disadvantage. I have only a very general recollection of this land. I would rather decline giving an opinion as to whether, by artificial means, the difficulties attending these irregularities could be obviated—that is an engineering question. I have examined the Calverley Brook on several occasions, and know that a large quantity of water flows down it as well as the sewage of Tunbridge Wells. It takes a good deal of the subsoil, drainage, and surface water, and the overflow from the Calverley springs, and on all occasions when I saw it there was a good deal of water in the brook; but it is not a large brook. In times of heavy rain, when under the proposed plan the sewage would flow into the brook, it would be very much diluted. I believe there are places where sewage irrigation is carried on—as at Carlisle and Worthing—without the use of tanks. I do not think that any one not accustomed to it would like to be near when the tanks are emptied.

The INSPECTOR: As a scientific man, what do you reckon should be the number of people per acre whose sewage ought to go on the land?

Witness: One hundred per acre.

The INSPECTOR: You would not allow more? You would say that in your judgment that is enough?

Witness: Yes.

R. B. Grantham, Esq., examined by Mr. RENSHAW.

I am a civil engineer, and hold an appointment under Government as inspector to the Drainage and Enclosure Commissioners. I am acquainted with the valley of the Calverley Brook, and have carefully examined that part adjacent to Mr. Goldsmid's property. I know the powder mill and Powder Mill Lane, and the 138 acres of land proposed to be taken for the sewage farm. I heard Mr. Lawson's evidence yesterday as to the gradients there being 1 in 5 and 1 in 20. I do not consider that land having such gradients is at all suitable for sewage irrigation. Part of the soil is loam, underlaid in some places by clay and gravel, as it is called in the country—it is rubbly rock, and some of the rock comes very close to the surface. It is a deep valley on the one side and rather higher on the other. Supposing the works proposed by Mr. Lawson were executed on that land, I do not believe it would prevent the sewage matter going into the brook. I think the slopes are so steep as to render it probable the sewage would at times run off into the brook not very much clarified. In ordinary times the sewage water would be clarified, but when there is a heavy rainfall there will be a greater quantity of water running down than the carriers can distribute properly, and the surplus water and sewage must find its way into the brook. Perhaps I may just state how I arrive at that opinion. I assume that the tanks are to receive the sewage in its pure state—that is its pure state as sewage, as it comes from the town; and it would, after being allowed to settle, be conveyed by a number of carriers from these tanks at a slow rate, to allow of its falling over the sides from one carrier to the other—of course, the sewage passing along at a slow rate, there would be a great deposit on the sides. In ordinary cases the water would afterwards find its way to the brook gradually, but when there is a greater quantity of water mixed with sewage than usual the deposit will not take place, but the whole will rush down very rapidly. Of the whole land proposed to be taken in the northern valley, that portion which belongs to Mr. Goldsmid is the worst adapted for the purpose, being the steepest. In my opinion the carriers would not prevent some portion of the sewage flowing into the brook. I believe the slopes would cause it to run off before it becomes clarified. By the term "clarified," I mean something very different from purified. It is, I fancy, a very great mistake to call the sewage water purified after irrigation; it can only, properly and strictly speaking, be said to be clarified. By that I mean that though all the flocculent and floating matters may be removed from the sewage, there may be noxious matters remaining in it still. That is the opinion of all chemists who have examined the waters. I know the sewage works at Croydon. I went over them on the 21st inst., and took some specimens of the water, which I now produce. The first was taken from the outfall at Beddington, just above the carriage-drive, where the stream enters Mr. Gurney's park. At the time it was taken it was so clear that, if put into a glass, any gentlemen in the room would have drunk it and pronounced it pure water. The present appearance of the water in the bottle shows that it was not pure.

The bottle was handed to the inspector, who, on putting his nose to it, said it smelt like hair-wash.

Witness: It would not be very nice to drink.

The INSPECTOR: I do not know whether the smell may be dependent upon the bottle into which the water was put, or whether "the scent of the rose will cling to it still."

Witness: The next bottle contains the sewage water before it was turned on to the land at all, but there had been some rain in the early part of the week before it was taken.

The INSPECTOR: It is really almost without smell.

Examination continued: The storm water at Croydon is not separated from the sewage. From my knowledge of the Beddington works, I consider they are much better adapted for irrigation purposes than the works proposed to be made here. The subsoil is better adapted for it, Beddington being on a more gravelly soil than Mr. Goldsmid's land. I do not think, after passing through the proposed works, the water in the Calverley Brook would be so clear in the ordinary way as the water I took at Beddington. I believe there is land nearer to Tunbridge Wells, on what is called Liptrap's Farm, which is better adapted for the establishment of sewage works than this. I know the southern valley towards Groombridge. Having read the report of Mr. Bazalgette, I went to see it. Mr. Bazalgette says: "After a personal examination of the northern or Tunbridge and the southern or Groombridge valleys, aided by further information you have been kind enough to supply, I agree with you that the land on the southern side is better adapted for sewage purposes. I am opinion that all objections which have been raised to the tunnel by which Mr. Lawson proposed to divert the sewage may be avoided by going through the railway tunnel, the general inclination of the railway being in that direction." I confirm the opinions there expressed by Mr. Lawson and Mr. Bazalgette. It is a flatter valley, and although they propose to carry the sewage, if I may judge from the deposited plans, as far as Adam's Well, and then along the high ground, yet there is in the bottom some very good land for the purpose of irrigation, although not so good as the land at Croydon by a great deal. I think it would be a cheaper plan to take the sewage as Mr. Bazalgette proposed, and that land in that direction could be found well adapted for its reception. It would not be carried quite so far as Mr. Saint's house. If it is necessary to extend the area, and to carry the northern sewage along with the southern, I should propose the formation of a culvert to carry it from the upper side past Mr. Saint's house, through Groombridge, and down to the lower land, where, as I have learned from Mr. Ryde, the land is of less value than it is above. I have not made an estimate so as to be able to speak very strongly as to the expense, but I should fancy it would be cheaper to carry the northern sewage through the railway tunnel to the southern valley, and to have one farming establishment instead of two so many miles apart. I know the outfall on the southern side; it is 5 feet in diameter, and that is quite sufficient to take the sewage of both the north and the south sides of the town. Under the circumstances of the land on Mr. Goldsmid's estate being so ill adapted for the purpose, it would be preferable to irrigate with the conjoint sewage in the southern valley. I should not go nearer to Mr. Saint's house than at present. I believe there would be no injury to the springs in the town by carrying a sewer through the tunnel.

Cross-examined by Mr. CRIPPS: The Calverley Brook receives the land drainage. I do not know that in that locality there is a considerable quantity of highly manured hop land. The water is as pure as water usually is flowing down such streams, and does not seem to have created a nuisance before the sewage of the town was turned into it.

Mr. CRIPPS: You referred to the Croydon case. You know it is said as a positive fact that in the case of Croydon the sewage water, after purification, is positively purer than that which is supplied by some of the metropolitan water companies?

Witness: I do not believe it. I do not believe such nonsense as that.

Mr. CRIPPS: Then you do not believe in the statement that, whereas some of the metropolitan water contains 21 grains of impurity, the sewage of Croydon, before being used for irrigation, contains 39 grains, and after utilization 23 grains?

Witness: I do not believe it. I dare say Mr. Baldwin Latham fancies that that is correct, but I do not believe it.

Mr. CRIPPS: After that you cannot agree with Mr. Bailey Denton yesterday, that we should lift the sewage and pour it upon high land, and that afterwards the Tunbridge Wells people should use the water which percolates through the soil?

Witness: I have had no experience to enable me to judge, but I think there is something in the suggestion of lifting the water. Mr. Bailey Denton's idea was that the water put on the Sandown estate would pass through the crevices in the rock and the sand for a considerable depth, and would come out tolerably clear. I cannot say that I go to that extent, but I think it is quite possible with that immense body of earth. If I were quite sure of getting a thick bed of gravel, or such sand as that for 100 feet in depth, I should be much tempted to try the experiment, for I think the water would come out much clearer than it will after going over Mr. Goldsmid's land. I have had some experience in irrigation schemes. I have been consulted upon some of them, and my Office has led me very much to consider the question in connexion with the drainage of valleys. I have held twenty meetings under the Land Drainage Acts, and we have had frequent discussions of the question of sewage works. I have not inspected the works at Croydon to any extent. I think the best land for sewage irrigation is clay underlying the gravel; but care must be taken to see what kind of gravel it is. The Croydon gravel is fine, clear, flint gravel, underneath the vegetable soil; here it is shaly rock, and I think the water would run over it unclarified. The soil is not deep enough in places. It would be impossible to use any portion of sewage at Liptrap's farm without pumping. I have been down to the northern outfall, and measured it. I do not know enough of the formation of the land to be able to say whether, if the scheme for taking the sewage on that side to the south were carried out, a considerable number of houses would be left undrained.

Mr. CRIPPS: Assuming Mr. Lawson's present plan were laid before Mr. Bazalgette, and he says [reading a letter], "I think the scheme of utilizing a portion of the sewage in the northern valley, and a portion in the southern

proposed by Mr. Lawson is the most advantageous one the board can adopt," should you agree in that opinion?

Witness: I should not. At the same time, I think each valley should take its own amount of water and sewage as a fundamental principle, but in this case, where the southern valley offers so much better opportunities for irrigation, I should regard it as an exception to the general rule. I think it would be better to concentrate the farms, on account of the facilities of management and dealing with several people for the purchase of land. I have gone down some portion of the Hartfield Valley, and thought there was land there which would be suitable—land of the same character as that near Mr. Saint's house. I should think, of the 138 acres proposed by Mr. Lawson to be taken in the northern valley, there are not more than from 20 to 25 applicable to sewage irrigation. The steep part of the land could only be adapted by the formation of enormous carriers along the slopes. [Sketch handed to witness.] I see by this it is proposed at every 13 feet to put a bank, and at every 52 feet you have to raise the banks 4 feet high all along the sides of the slopes. A precious job it would be—a nice expense; and the land would be almost impossible to work. You could not get a cart along with a rise of 1 foot in 13. This sketch only shows that the land is more unfit for irrigation purposes than I thought it was.

Re-examined by Mr. RENSHAW: The 25 acres suitable for irrigation are detached pieces extending throughout the whole of the land proposed to be taken.

Mr. RENSHAW said that was his case, and he would now offer a few remarks upon it. He called the attention of the inspector to the fact that Mr. Lawson, in his first report, deemed the valley in the north too narrow for irrigation purposes, and recommended that the whole of the sewage of the north should be sent to the south. Mr. Grantham was also of that opinion, and Mr. Bailey Denton distinctly showed that the land selected in the northern valley was unfit for the purpose, but that there was some land at Liptrap's farm which was suitable. The Great Lodge estate, of which that formed a part, was now in the market, and Mr. Bailey Denton suggested that it appeared on the face of the thing as if there was a spite against Mr. Goldsmid in placing the sewage, according to Mr. Lawson's present plan, as near as they possibly could to his mansion. He (Mr. Renshaw) would not go so far as to say that, but at the same time it certainly had such an appearance.

The Hon. Mr. MOLYNEUX: I protest against that. I consider it my duty to say that no feeling of the sort exists among the commissioners.

Mr. RENSHAW said he thought Mr. Goldsmid, as the owner of the land, had a right to protest against the carrying out of this plan, in his peculiar position and with his solemnly adjudicated rights. He then proceeded to review the evidence, and called special attention to that of Dr. Voelcker, who stated most distinctly that the sewage on some occasions would flow into the brook. If so, he would ask would not Mr. Goldsmid's injunction be infringed, the terms of which were that no sewage should go into the stream to the injury of the water. It was said of some people that they were very liberal with their own advice and with their neighbours pockets, and it seemed to him in this case that if the proposed plan was carried out, the commissioners would be very liberally disposing of the sewage of the town, and assisting themselves at the benefit of their neighbours lands. The scientific evidence he had called proved most decisively that on occasions of the prevalent winds, the smell from the sewage could be smelt at Somerhill, and under those circumstances, looking at the evidence adduced on both sides (for Mr. Lawson had given his evidence most candidly and fairly), the land on the Great Lodge should be purchased for the proposed sewage farm. He again desired to point out that Mr. Goldsmid had not put any undue pressure upon the commissioners, and argued that to adopt the proposed plan of Mr. Lawson would be only a revival of the old nuisance as it heretofore existed, and place Mr. Goldsmid in a very much worse position than he now was with his rights declared and the injunction in his possession. It was not for him to point out the best plan, but the one now proposed he would again say had been shown to be likely to result in a continued contamination of the brook, a continued infraction of the injunction, and, therefore, under the circumstances one that should not be sanctioned by the Legislature.

Mr. HOPWOOD, on behalf of the Rev. Mr. Stephens, then addressed the court, and said that his client was merely actuated by the usual motives which actuated every person in possession of property to look after and see that it was not injured or trespassed upon, and to see that the interests of a community near him were not affected by the wants of a community some little distance from him, by a plan to bring that which was a common nuisance to all from the natural place where it was deposited by the last, to the detriment and injury of the first. He desired at the outset to call the attention of the inspector to the 24 & 25 Vic., 1861 (Local Government Amendment Act), s. 4, which was particularly applicable to this case. The proviso, after stating the local board might exercise the powers given them by the 45th section of the Public Health Act, 1848, for the purpose of making outfalls, sewers, and the distribution of sewage, upon making compensation to be settled in the manner provided by the 144th section of the same Act, was to this effect—"Provided always that nothing herein contained shall give or be construed to give power to any local board to construct or use any outfall, drain, or sewer, for the purpose of conveying sewage or filthy water into any natural water-course or stream until such sewage or refuse water shall be free from all excrementitious, foul, or noxious matter, such as would affect the purity or deteriorate the quality of the water in such stream or water-course." By Mr Lawson's own admission, the inspector was called upon to report upon a scheme which violated one of the stipulations in that section, for it was proved that the water flowing in the stream called the Calverley Brook would not be free from excrementitious, foul, or offensive matters. He understood from Mr. Lawson that, in items of excessive storm and rain, the sewage would run into this brook, although it would be diluted considerably. But did the Act of Parliament say anything about dilution? He considered, partly from Mr. Lawson's admission, but especially from the evidence of several other witnesses called, that the land at the Powder Mill Lane, adjoining Mr. Stephen's land, was too steep for irrigation purposes. The fact of this stream being deteriorated in the manner described was a matter for attention before any such scheme should be sanctioned. Mr. Lawson had given no reason for having abandoned his original scheme; and he (Mr. Hopwood) thought he had a right to say that the present was not the best plan that could be put forward. The tanks, from which very offensive smells would arise, especially when they were emptied, which would be frequently, were only a very short distance from the land he represented. This land, although not built upon now, was of a value beyond a mere agricultural one—which, being interpreted, meant that if it went to the market for building land, it would fetch a very large sum. If the needs of the community of Tunbridge Wells required this land they ought to have it; but then it had not been shown that it was absolutely necessary to have it. The Tunbridge Wells people ought to wash their dirty linen near at home, and the nearer the better. Southborough was increasing in the direction of Tunbridge Wells, and why was it that this nuisance should be sent there? He could not get any satisfactory answer from Mr. Ryde as to whether he had included in his estimate anything for the damage arising from the smell which would be occasioned. The land he represented rested in a great degree for its value on the prosperity of Southborough, which was, as they all knew, a salubrious village, having as high a reputation in a small way as Tunbridge Wells had in a great; and on the reputation of that village depended the value of the surrounding land. But what would be the effect if people knew that an enormous quantity of sewage was deposited there? They would keep away from the place. If the plan was put into execution, Mr. Stephens's land would stand literally in bad odour, and for the future its ambition would be limited to the very humble prospect of being occasionally favoured with a little of the refuse from the carriers or pipes which would perhaps radiate from the enormous tanks erected there. On the point of law, on the point of objection to the estimates, as well as on the point of unnecessary damage inflicted upon his clients and others, he submitted that it would be the duty of the inspector to report against this scheme.

The INSPECTOR: Now we will go to the south side.

Mr. CRIPPS said he would recall Mr. Lawson, for the purpose of affording an opportunity to his learned friends to cross-examine him.

Mr. *Lawson* recalled, and in answer to questions by Mr. ALLEYNE, said that he proposed to take the sewage from the mouth of the present sewer, and to carry it by the intercepting sewer at a higher level to the proposed deposit-tanks, which were near Roper's Gate, 3½ miles from Groombridge, and from there by a conduit, culvert, or sewer at a higher level than the present brook, which sewer or conduit will be discharged in tanks proposed to be erected on the land intended to be purchased for irrigation works in the south near Waghorne's Gate. These tanks would be 182 feet in length, about 16 feet wide, open at the top, and about 3 feet deep. They would be close to each other, and parallel. The nearest part of the sewage farm to Mr. Saint's house would be about 350 yards, but how far from his pleasure-grounds he could not say. No doubt there would be some smell from these tanks when they were being emptied and spread upon the land, but very little when in use. The distance of these tanks from Mr. Saint's house would be about 1450 yards. The distribution would commence at the tanks, and go on until the last part of the sewage would be applied to the land nearest Mr. Saint's house, and during the whole of its course the work of irrigation would be going on. Of course, during that process he would not say there would be no smell, because he did not think that would be quite the truth; but he could tell them, as a fact, that he had been upon land irrigated by sewage, and he could not tell from the smell that it was irrigated. If the evidence as to the prevalent wind was correct, the smell would be carried in a contrary direction to Mr. Saint's house, as the prevalent winds were said to be the south-west. During an easterly wind, Mr. Saint might smell something from the sewage farm. He was aware that it would be impossible at times to deal with the whole of the liquid discharged from the present outfall sewer, and at these times the sewage and rain water would flow together, and in consequence of the rain which fell upon Tunbridge Wells, and by brooks and streams coming from a distance, the sewage would be diluted before it passed into the brook. Under no circumstances, however, did he think that would be prejudicial. At the present moment the whole of the sewage in the southern valley, in the most objectionable form, flowed into the brook and passed Mr Saint's house. There was a possibility of some sewage going into the brook in an objectionable manner, for no works were perfect; but these would be as perfect as he could devise them, and he knew they would purify the water to a very great extent. With respect to the mill, that would be a question for compensation, and he was not prepared to say that no part of the works would injure either the miller or his mill. He used his common sense and judgment in selecting the land, and in his opinion it was absolutely necessary to adopt some scheme, and if his original plan was carried out it would cost a great deal more money, and that was an important matter. If it could have been carried out for the same money as the present one, he thought it preferable. At the present time the whole of the southern sewage went into Mr. Saint's pond, but when these works were carried out the sewage would be first of all intercepted in the tanks, and the remainder made use of in irrigating the land. The sewage would then flow off and the water enter the pond, and then it might be probable some fish would be in it. If the works should lessen the value of the land, it would be a matter for compensation; but he did not know what the local board were prepared to pay supposing the works rendered Mr. Saint's house uninhabitable. The nearer they came towards Tunbridge Wells the narrower became the ground, and he had in this case selected the land which appeared to him to be best suited for the purpose in that locality. He thought that from the main road of the village to the nearest part of the farm would be about 600 yards. Under the peculiar circumstances of an east wind and a very murky atmosphere, perhaps, Groombridge would smell something from the sewage; but, unfortunately for the people who lived in that village, they were at present subjected to a far greater nuisance right under their noses. Under the very peculiar circumstances he had mentioned the villagers might get a sniff of the sewage. He had endeavoured to give the local board at Tunbridge Wells the best advice he could, and he considered his plans would answer the purpose. If he had considered he was going to poison the inhabitants of Groombridge, he should not have proposed it. If the sewage farm was made at the other side of Groombridge it would be nearer the village, and the prevalent winds would blow the smell right to the village. No doubt suitable land for irrigation was to be found in the Hartfield Valley.

In answer to the INSPECTOR, *witness* said as nearly as possible all the land proposed to be taken on the south side could be irrigated—perhaps 100 acres out of 169 could be irrigated; and so on the north he should say there was about 90 out of 138 acres. He had reckoned the population of the north at 4000, with prospective increase, and the south at 12,000. On the north side, from the existing outfall to the proposed tanks, the distance would be 3126 yards, and on the south 3895 yards, and the tanks on the north were about one mile and three furlongs from Somerhill Lake.

Mr. HOPWOOD asked whether Mr. Lawson had fixed 4000 as an average population for the year, or whether he took into account the fluctuation made by visitors in the season.

Mr. CRIPPS replied that it was upon the general average population, as the residents went away in the season and let their houses.

This completed the case for the south.

Mr. ALLEYNE said he did not think it necessary to call any evidence. He had the honour to oppose on behalf of the Rev. J. J. Saint and Mr. Geo. Field, two large landowners in the immediate neighbourhood of Groombridge, proposed to be affected by these sewage works. Enough had transpired during the long investigation to show them how deeply interested those

gentlemen must be with reference to these works, and how seriously they might be both affected if this scheme were carried out. These gentlemen were too well known in the immediate neighbourhood to oppose anything which might benefit any neighbourhood, provided it did not interfere very seriously with their own. He had heard a great deal of the injury likely to occur to Mr. Goldsmid if these works were carried out, but these would apply in a much stronger degree to his clients, especially Mr. Saint; for if Somerhill was likely to be affected at a distance of a mile and a quarter, what would be the injury to Mr. Saint's residence, which was only a few yards distant? It was not necessary for him to enlarge upon the serious injury that must result to Mr. Saint's property, being in the immediate neighbourhood of the proposed works. Scientific men told them there would be little or no injury arising from the smell, and others that there would be very serious results; but, generally speaking, the best way to arrive at the truth would be to take a medium, and in such case no doubt very serious injuries must result to his clients. Even Mr. Lawson admitted that the smell might reach Mr. Saint's house, and also the village of Groombridge. That was a most important admission, because if such might be the possible result—to say nothing about the conclusive result, because the great majority of opinions were that the effluvia could be smelt much further than what Mr. Lawson had admitted—at all events Mr. Saint's house was unfortunately in that proximity that it must necessarily suffer from it. Looking at the consequences that would thus naturally ensue, he was sure the inspector could not recommend any such scheme. Mr. Lawson had said that a little "sniff" might reach the village. But did not they all know that great conflagrations sometimes arose from small sparks? and from this little "sniff" reaching that populous village very serious results might follow. Could Mr. Saint reside in a house with the general opinion that the effluvia would reach him? Could he, with due regard to his health and that of his family, remain in his house? No one, of course, would reside in the house if he could avoid it. The consequence would be the house would be perfectly useless and valueless, and his client would certainly require a sufficient compensation. Was he to be driven from his house and have no equivalent? What equivalent could be given unless the commissioners proposed to purchase the whole estate, comprising upwards of 300 acres, as the remainder of the land would be so much depreciated in value? Had a case of absolute necessity been made out, he should have had some difficulty to meet the case, but he respectfully submitted that no absolute necessity had been shown that the first plan of carrying the sewage to Hartfield should not be adopted. He was somewhat struck at the observation which fell from Mr. Renshaw—proposing to get rid of what he considered a nuisance to his client, regardless of what the consequences might be—that if they could send the sewage of the north to the south, that would satisfy his requirements. He (Mr. Alleyne) had no wish whatever to send any additional sewage to the north, or in the neighbourhood of Mr. Goldsmid, and he would not wish him to send any to them in the south. He considered the fairest system would be to let the sewage of the north go to the north, and of the south to the south, and be carried to that spot where it would be perfectly harmless when dealt with. He very much doubted that the estimate of £40,000 for the land in the south was anything like a reasonable one, for the average of such land at the very least was £200 per acre. He was prepared to say that there would not be any opposition to Mr. Lawson's original scheme being carried out for taking the sewage into the Hartfield Valley, and he appealed to the inspector to give the matter the fullest consideration, and see that no scheme was carried out that would prove a nuisance.

After some observations by Mr. TRUSTRAM, a commissioner, as to the probable effect of carrying the sewage through the railway tunnel from the north to the south,

Mr. CRIPPS replied upon the whole case, and, after reviewing the evidence given in opposition, submitted that the evils pointed out were all imaginary evils, which practical experience showed were truly unsubstantial, utterly unworthy to be called objections, and were not such as should be put in the face of a large and important scheme which would not only be to the interest of Tunbridge Wells, but the whole neighbourhood. The local board had to do something, for they were pressed on all sides, and as the sequestration was not suspended, only standing over until the 8th of February, the case was an urgent one.

This concluded the inquiry on the sewage question.

SATURDAY, JAN. 26.

The INSPECTOR, attended by some members of the local board and others, visited the sites of the proposed works this morning, and afterwards attended at the town-hall to consider the question of the alterations proposed to be made in the Tunbridge Wells Water Act.

Mr. W. P. TRUSTRAM read the petition, which prayed that the money borrowed on the water-works account should be made payable in fifty years instead of thirty. He stated that the local board had sufficient to meet expenses until next Michaelmas, without going to the general district-rate. The question of whether they should go to the general district-rate had been discussed two or three times in the local board, and two divisions had been taken on the subject, and all against the rates being taken out of the district.

The COMMISSIONER considered they ought to mortgage their property before they burdened their rates. He thought that was a matter of fair play to the ratepayers.

Mr. BROWELL remarked that they wished to pay every debt incurred out of the water-works fund, if possible, but a great many of them thought that inevitably, sooner or later, it would be necessary to fall back on the general district-rate; and they considered the sooner the better they remedied this, so that the debt might be fairly spread over a number of years. They should in his opinion do something, for in a short time they would have to pay an enormous expense in the sewage affair.

After some conversation on the subject, a vote of thanks was given to the inspector for the kind attention he had paid to the business before him.

Mr. TAYLOR briefly thanked the commissioners, and said he would do his duty in the matter. He knew they were in great difficulties, and he should do what he could to assist them.

The inquiry then closed.

EXPLOSION OF GAS.—At about one o'clock on Saturday the inhabitants of Regent Circus, Piccadilly, and neighbourhood were greatly alarmed by a loud explosion. It appears that the main gas-pipe being leaky, some workmen belonging to the Western Gas Company were engaged in making the necessary repairs, when by some means the gas suddenly ignited with an explosion of great force. One of the workmen was so seriously injured that it was necessary to remove him at once to the hospital.

Miscellaneous News.

CANTERBURY GAS AND WATER COMPANY.

On Friday, the 31st ult., at noon, the Half-Yearly Meeting of the Company of Proprietors of the Canterbury Gas and Water Works was held in the Music Hall of that city—GEORGE FURLEY, Esq., banker (chairman of directors), presided, and read the report for the half year, as follows:—

Your directors have to report that since the last half-yearly meeting of the shareholders they have resumed possession of the gas-works and concluded the contract entered into with Messrs. Anderson and Jones, the manufacturers of gas.

With regard to the extensions, your directors regret having to report that the tank for the new gasholder has failed to retain the water, and, after several unsuccessful attempts on the part of the contractors to remedy the evil, they have taken the work into their own hands, and they trust shortly to be able to complete the tank in a satisfactory manner. The sum of £120 17s. was reserved from the payment made to the contractors, and, in the opinion of your directors, will be available towards making good the tank.

Your directors feel that the non-performance of the contract has operated very prejudicially to the company, as they have been unable to supply the necessary quantity of gas to the consumers for the present winter season.

With regard to the water-works, your directors have given the necessary legal notices to the owners and occupiers of the land required for the works, so as to obtain possession thereof; and Mr. Homersham is now preparing the working plans and specifications to be submitted to your directors previous to contracts being entered into for the works. Your directors, upon mature consideration, believe that a good softened supply of water will be far more saleable than the hard chalk water now in general use in the city, and Mr. Homersham's plans will include the necessary appliances for this purpose. This will involve an increase of the water capital, and as soon as the required amount can be ascertained, a special meeting of the shareholders will be called to consider the matter and authorize the raising of such additional capital.

The capital account at the present time stands thus:—

Old capital, gas and water works . . .	£22,500
Amount of A shares allotted	8,000
(Ditto paid thereon, £7442)	
Amount of B shares subscribed for . .	17,680
(Ditto paid thereon, £4910)	
Total	£48,180

Your directors point with much satisfaction to the ready and liberal manner in which the citizens of Canterbury have taken up the new capital required to carry out the gas extensions and water-works. They trust that the energies of all the shareholders will be directed towards inducing the citizens generally to take the water of the company when the works are completed, and the shareholders may then look forward to a long and prosperous career.

The balance-sheet, as audited by Mr. Lancaster, shows a profit on the gas-works of £1164 7s. 9d., and on the water-works of £107 16s. 11d., making together £1272 4s. 8d. The debts due to the company on the 1st of January inst. amounted to £3639 12s. 1d., and the debts due from the company to £2237 16s. 2d. The balances in hand at the same time were—Treasurer's account, £1627 7s. 10d.; in the secretary's hands, £2 18s. 11d.: making together £1630 6s. 9d.

Your committee beg to recommend that a dividend at the rate of 6 per cent. per annum for the last half year, free from income-tax, be declared upon the original stock; and that the new shareholders be paid interest upon their shares from the 30th of June last, or the several days of payment according as it may happen, until the 31st of December last, at the rate of 6 per cent. per annum, which will require altogether £890 5s. 5d.

Your committee call attention to the valuable and arduous services rendered by Mr. James Burch, the secretary, during the last six months. A large amount of additional work has been thrown upon him in consequence of the reconstruction of the company, and the increase in the number of its shareholders; and they have much pleasure in recommending that a gratuity of 25 guineas be paid to him.

They feel, also, that the collector, Mr. Jones, has been assiduous in the discharge of his duties, and they beg to recommend that his salary be fixed at £70 per annum.

According to the terms of the Act of Parliament, Major Castle and Mr. R. Y. Fill retire from the direction, but offer themselves for re-election; and there are two other vacancies in the board. The other candidates for the seats in the direction are Messrs. Edward Rayner and William Sharp.

The CHAIRMAN said he had much pleasure in moving the adoption of the report, because under the adverse circumstances they had had to contend with the directors had been enabled to recommend a dividend at the rate of 6 per cent. for the half year, free of income-tax. He trusted this would give satisfaction to the general body of shareholders, and that it was but the inauguration of a long and prosperous career to the company. They were about to enter into a large undertaking in the matter of providing a good and sufficient supply of water, and the scheme held out every promise of being most remunerative and beneficial. It was a source of considerable gratification to the directors that the citizens of Canterbury had come forward and so readily subscribed the capital required for the completion of the works. He had much pleasure in moving the adoption of the report, and also that a printed copy of the financial statement, as read, be sent to each shareholder.

Mr. PETER MARTEN (a director) said he had much pleasure in seconding the motion just made by the chairman. The statement of accounts was so satisfactory, and the remarks of their chairman were so concise, that it was unnecessary for him (the speaker) to offer any additional observations.

The motion was put and carried unanimously.

The CHAIRMAN next submitted a proposition, to the effect that a dividend for the half year ending the 31st of December, 1867, at the rate of 6 per cent. per annum be declared; and this, on being seconded, was carried *nem. dis.*

The next business was to fill the vacancies in the list of directors, and the CHAIRMAN announced that two gentlemen—Major Castle and Mr. R. Y. Fill—retired by rotation, but that they were willing to be re-elected.

This was accordingly done, and Mr. William Sharp and Mr. Edward Rayner were appointed in the place of other late directors.

The CHAIRMAN then submitted a motion that donations of five guineas be presented to the Kent and Canterbury Hospital and to the Canterbury Dispensary.

Dr. REID inquired if the shareholders could dispose of money in that way.

The CHAIRMAN answered in the affirmative, adding that the proceeding had been adopted ever since the constitution of the company. It was thought by the directors that, as the company employed a large number of workmen, any of whom were admitted into the institutions named in case of accident or sickness, the company should recognize the benefits thus dispensed by subscribing to their funds.

Mr. MARTEN: The authorities at the Poor Law Board sanction the proceeding when adopted by local boards of guardians.

Dr. REID explained that he did not object to the vote, his only desire being to ascertain if it was legal.

The CHAIRMAN: The shareholders can do what they like with their money at this meeting.

Discussion having been invited on the conduct of the directors,

Mr. DOBELL asked when it was proposed to commence the new water-works.

The CHAIRMAN replied that the plans and specifications were not ready, but Mr. Homersham, the engineer, was hard at work upon them. So soon

as they were submitted to the directors they would be laid before the general body of shareholders, and proceedings commenced without delay.

Mr. MUDFORD suggested that a copy of the directors report should be sent to each shareholder, together with the balance-sheet, and this was directed to be done in future.

The customary vote of thanks to the chairman and directors concluded the proceedings.

THE ANGLO-ROMANO WATER COMPANY.

This company, which was established some few years ago, is being wound up voluntarily. It has changed its title, and will be carried on under fresh arrangements, in order that it may meet certain obligations imposed upon it by the authorities in Rome.

A brief outline of the history of the Anglo-Romano Company, and the reasons for its amalgamation with a Belgian company, may not be uninteresting to our readers. The company was established in London, with headquarters in Broad Street, in November, 1865, and was duly incorporated and registered with limited liability under the Companies Act, 1862. Its capital was £200,000, in 20,000 shares of £20 each, and its objects were to construct aqueducts, reservoirs, and water-works for supplying water to the city of Rome and its neighbourhood; in fact, it was established for the purpose of carrying on in Rome the business of a water company in every sense of the term. One of the earliest steps was to acquire a concession from the Pontifical Government for reconducting and distributing the Marcian waters (*aqua Marcia*) in the city, and this concession was granted to Messrs. Shepherd, Fawcett, and Moraldi, and by them assigned to and vested in the company, and a considerable number of shares were allotted, the greater portion being taken by persons resident in Rome and the neighbourhood. In June the company met with difficulties, owing to certain objections which the Roman Government raised to its Articles of Association, for its acquiring a legal status in the city. A meeting of the Roman shareholders was held, Mr. Cholmeley, one of the directors, being in the chair, when the question affecting the legal constitution of the company in Rome was considered, and a committee was appointed to examine and report thereon, and a proposition for converting the shares of the company, which were duly paid up, into shares transferable by delivery was approved. A suggestion was then thrown out that negotiations should be entered into with a company, called the *Compagnie des Conduites d'Eau*, which was established at Liège, and it resulted in the issuing by the Roman directors of a circular, dated March, 1867, which set forth the objects for which the meeting had been held, and stating that out of the 10,000 shares 3000 had been reserved for and taken up in Rome, but that, owing to the financial disasters which had occurred in London, 821 shares only had been taken by the public, consequently at the very outset the operations of the company were to a certain degree paralyzed.

Notwithstanding this unexpected check, the company had commenced operations, hoping that a return of financial prosperity would open the London market to them; but, unfortunately, such was not the case, and no further shares were placed in London. Plans of the operations of the company had been prepared, and exhibited to the Minister of Public Works on the 8th of May, but in August following a ministerial dispatch was received, informing the directors that the surveys were in general approved, but that the *Conseil d'Art* had introduced certain modifications. The effect of those modifications was to place the company under the necessity of going over the whole ground again. However, the modified plans were in due time again presented, and the official approval was obtained, so that the company were enabled to take the ground and commence the works, so far as the engineering department was concerned; but again they were met by obstacles which they had not foreseen. It appeared that article 17 of the concession imposed upon them the condition of justifying to the Ministry (within six months of the date of the concession) the possession of sufficient means for carrying the works into effect, and an imperative dispatch was forwarded to them, stating that the minister was determined to carry the terms of this article into execution. This was a difficulty which the directors could not meet. With their then limited share list they could not comply with the demand, and confiscation stared them in the face. However, they felt that no time ought to be lost in seeking other means to avert the ruin which menaced them, and fortunately they succeeded in finding a remedy by making a provisional arrangement with certain parties which enabled them to satisfy the requirements of the Roman minister, and so bring the company to a successful conclusion.

The company with whom they had treated was the *Compagnie des Conduites d'Eau, Société Anonyme*, which was composed of some of the best names in Belgium, and whose operations, it was said, were as successful as they were extensive. An extraordinary meeting was held in compliance with the circular, and the arrangements with the new company were ratified, so as to be in a position to meet the Pontifical Government, and the Anglo-Romano Company was to be changed to a *Société Anonyme de l'Aqua Marcia*; so that, by an assimilation of articles to the Roman law, they conformed to the conditions imposed upon them by the articles in the concession referred to. The board of directors was to consist of nine members, five to be named by the *Compagnie des Conduites d'Eau* and four by the new company, and with the understanding that Messrs. Cholmeley and Shepherd should be immovable from the board for three years. The capital was to remain at £200,000, or 5,000,000 frs., divided into 10,000 shares of 500 frs. each. The present company engaged on their part to convey the concession, survey and purchase the ground necessary for the works, and to construct the brick conduits and works of art, &c., from the springs of Tivoli to Rome, for the sum of 2,450,000 frs., represented by 4900 shares; whilst the *Société des Conduites d'Eau* on their part engaged to take up the remaining 5100 shares, representing the sum of 2,550,000 frs., for which they agreed to execute the remainder of the works, to furnish and lay in place a cast-iron pipe two feet in diameter, capable of delivering 30,000 cubic mètres of water per 24 hours, from Tivoli to Rome, a distance of 27 kilomètres, and also to furnish and lay the pipes in the interior of the city for the distribution of the water to the extent of 15 kilomètres, with the necessary valves, hydrants, &c. Both parties engaged to complete the works within two years and half of the date of the approval of the surveys.

It was believed that the works undertaken by the new company from the Tivolian springs to Rome might be completed for a considerably less sum than 2,450,000 frs., as, after a most rigid and careful survey and estimate made by the engineer, and of the tenders furnished by different contractors, this appeared to be very probable. The company therefore look forward to having, within the specified time, the works completed, and then to secure a profitable return on the capital invested by the sale of water in Rome. Of this there can be no doubt, that the company may rely upon certain sources of profit, arising from the sale of water for irrigation as well as for motive power.

The company—besides furnishing the concession, and providing for the erection of earth works, galleries, aqueducts, &c., from the source at Tivoli—will have, during the execution of the works, to bear the administrative expenses of the engineer and his staff, which are placed at 667,041 frs.; and there is a provision that, if the cost of the works outside should exceed 2,450,000 frs., then the balance is to be carried to the credit of the new *Aqua Marcia* Company.

The works from the source of the Marcian waters to Rome are to be executed with iron syphon pipes, 60 centimètres in diameter, over a distance of about 24,240 mètres; and the reservoirs at Tivoli are to be connected by pipes of a diameter of 35 centimètres, over a distance of about 1560 mètres. In the interior of Rome pipes will be laid over a distance of from 10 to 15 kilomètres, valued at 150,000 frs.

The *Société Anonyme* are bound to respect the agreement made between the concessionaires and M. Nicholas Moraldi, as a perpetual member of the board, and also the payment to him of 25,000 crowns during the progress of the works; at the same time, they are bound to respect the contract stipulated between the said concessionaires, Messrs. Shepherd and J. H. Fawcett, on the one part, and the Anglo-Romano Company on the other. For the better interpretation of the arrangement, Messrs. Cholmeley, Shepherd, and Viale, on the one part, and M. Léopold de la Vallé Poussin (a director of the *Compagnie des Conduites d'Eau*), on the other, are to have seats at the board for three years at least from the date of the contract.

The works are to be executed according to the plans and drawings of M. Berger, under the approval of the board, and that gentleman will be the engineer-in-chief. Under no circumstances is the time for the completion of the works to be extended, and there will be penalties inflicted on the contractor for default.

A committee of five shareholders was appointed to frame the necessary constitution of the new company, and on the 21st of December last a meeting was held, at which it was proposed that the Anglo-Romano Company should be wound up voluntarily, with a view to its ultimate dissolution and sale to the new company, to be formed according to the Roman law, and to be entitled *Société Anonyme de l'Aqua Marcia*, and that the winding up should commence immediately from the time when the resolution was confirmed. Mr. Frederick Bennett was appointed liquidator for the purpose of the winding up, and he was authorized and empowered to sell and transfer all the business, the concession, goodwill, and assets of the old to the new company.

A petition was presented by the company to the Master of the Rolls, stating that proceedings were threatened in respect to certain alleged claims for services rendered in Rome and in this country for engineering work; and, under the circumstances, various questions, doubtless, would arise requiring the supervision of the court. The petitioners, therefore, prayed his lordship to voluntarily wind up the company under the supervision of the court, and to make such other orders as might to him seem meet.

On the 25th of January Mr. JESSEL, Q.C., prayed his lordship to make an order for a continuous voluntary winding up of the Anglo-Romano Company under his supervision, observing that the company, which was a very successful one, was originally formed for the purpose of bringing the ancient Marcian waters back to Rome by means of aqueducts and pipes. The Roman Government saw the importance of the works, and insisted that they should be carried out according to the Roman law. The Anglo-Romano Company not being able to comply, had become merged into a *Société Anonyme*, and therefore prayed to be wound up under his lordship's supervision. The application would not be opposed by any one.

Mr. SWANSTON appeared for certain shareholders.

Lord ROMILLY made an order to continue the voluntary winding up under supervision, with the usual order as to costs, including one set of costs to shareholders supporting the order.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE GAS SUPPLIED IN ST. MARYLEBONE, IN DECEMBER, 1867:—

DECEMBER.	Illuminating Power in Sperm Candles.			Mean Pressure in 10ths of an inch.		Mean Amount of Sulphur in 100 Cub. Ft.
	*Mean of 24 Observations.	Highest.	Lowest.	Highest.	Lowest.	
Imperial Co.'s gas . .	15·57	16·34	15·06	25·48	9·55	22·60
Chartered Co.'s common gas	13·23	13·87	12·39	34·28	14·27	20·65
Chartered Co.'s cannel gas	21·10	22·79	20·07	38·23	13·56	22·34

* Each observation consists of 10 readings of the photometer.

The excellent illuminating power of the Imperial gas—as determined by photometric observation—during the past year, has been fully maintained during the month of December. The mean light, as the table shows, was equal to 15½ candles, or nearly 30 per cent. above the standard; and on no occasion did it fall below 15 candles. The pressure was generally good, but the testings for sulphur showed 2·60 grains more of this impurity than what is permitted by law. The mean illuminating power of the Chartered common gas was equal to 13·23 candles, and on no occasion did it fall below the standard; its pressure was uniformly good, but the result of three testings showed an excess of sulphur to the extent of 6·65 grains. The cannel gas of the same company gave a mean light equal to 21 candles; its pressure was satisfactory, but in this gas also the sulphur was excessive.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE WATER SUPPLIED IN ST. MARYLEBONE, IN DECEMBER, 1867:—

DECEMBER.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	Dec., 1866. 0°	Dec., 1867. 0°	Dec., 1866. 0°	Dec., 1867. 0°	0°
Distilled Water . . .					
West Middlesex water	20·28	20·80	0·88	0·72	—
Grand Junction water	20·96	20·72	0·92	0·76	—

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

REDUCTION IN THE PRICE OF GAS AT BATH.—The Bath Gas Company announce their intention of reducing the price of gas 3d. per 1000 cubic feet. The price will then be 3s. 6d. per 1000 cubic feet.

THREATENED ACTION AGAINST A GAS MANAGER FOR FALSE IMPRISONMENT.—The *Warrington Guardian* says that an action is about to be brought against the manager of the Warrington Gas-Works for false imprisonment by the men who were lately apprehended in the town on a charge of attempting to blow up the gas-works.

REDHILL.—The consumption of gas has increased so rapidly in this rising residential town as to induce the Redhill Gas Company to invite a limited number of contractors to send in plans, specifications, and tenders for the erection of a new cast-iron tank and gasholder on their works, of which those submitted by Messrs. Samuel Cutler and Son, of Millwall, London, have been approved of and accepted. The gasholder is to be 80 feet in diameter by 26 feet 6 inches deep, and the tank of proportionate dimensions.

DESTRUCTION OF A GASHOLDER AT HULL.—About half-past two on Saturday afternoon a huge gasometer, belonging to the British Gaslight Company, holding 240,000 feet of gas, was blown down by the violence of the gale and shattered to pieces. The violence with which the iron came together caused the emission of sparks, which set fire to the gas. Fortunately no person was injured. The damage done is very great. The numerous workmen engaged on the premises set to work vigorously to extinguish the flames by means of hose and stand-pipes kept on the works. Information being conveyed to the water-works, which are hard by, a tremendous force of water was brought to bear on the fire, which was got under in the course of an hour.

THE NEW RIVER COMPANY AND THEIR APPRENTICES.—The New River Company have presented a watch to each of the most deserving of their apprentices who have recently completed their term of servitude. The watches (handsome levers by Benson) bore the following inscription:—"From the Honourable the New River Company to ——, as a testimonial of good conduct during apprenticeship."

CONVICTION FOR DISCHARGING GAS REFUSE INTO A SEWER.—The directors of the Western Gaslight Company, whose works are at Kensal Green, were summoned on the 28th ult. before Mr. Ingham, at the Hammersmith Police Court, by the Metropolitan Board of Works, under the 205th section of their first Act, for allowing a quantity of gas refuse to flow in the Counter's Creek Sewer, one of the main sewers of the metropolis. Mr. Ward, the assistant solicitor to the board, supported the summons. Mr. Thomas Lovick, the board's assistant engineer, stated that the refuse was discharged into a private drain belonging to the company, from which it flowed into the main sewer. On the 4th of November the sewage was impregnated with gas refuse, and smelt very badly. He called upon the engineer to the company on the same day and informed him of the fact. Mr. Barber, the secretary of the company, said the facts were not disputed. The company were not aware that the smells proceeded from their works, but had always supposed that they arose from the creosote works of the London and North-Western Railway Company. He thought it rather hard that the directors should be summoned, when the complaint had been admitted. The directors had caused certain works to be done, and had offered to carry out any others which the board might direct. They were under the impression, up to the time of receiving notice of the nuisance, as advised by the engineer, that the smells did not proceed from their works, and they were ready to do everything which the board might direct, regardless of expense, so as to avoid so serious an inconvenience to the public in the neighbourhood, who were all consumers and friends. Mr. Ingham said that as the nuisance existed in August last, and as recently as Saturday week, there had been neglect on the part of the company, and they must pay a fine of £5. He was, however, sure that now their attention had been called to the matter, they would complete their works in a satisfactory manner. Mr. Ward asked for costs, and Mr. Ingham granted the board two guineas.

Share List of Metropolitan Gas Companies.

No. of Shares issued.	Amount per share.	Name of Company.	Amount paid up per Share.	Div. per Cent. per Annum	Price per Share.
	£		£ s d	£ s d	£ s d
8000	10	Anglo-Romano . .	10 0 0	9 0 0	11 to 12
5000	20	Bahia (Limited) . .	20 0 0	nil.	
1000	20	Do., preference .	20 0 0	10 0 0	27 10 0
750	20	Do., do., redeem.	10 0 0	10 0 0	12 10 0
40000	5	Bombay (Limited).	5 0 0	5 0 0	4 to 4¼
10000	5	Do., third issue .	3 0 0	5 0 0	2 to 2¼
10000	20	British, Limited . (Norwich, Hull-Sculcoates, Hanley, Tunstall & Sheiton [Potteries], Trowbridge, & Holywell.)	20 0 0	6 0 0	28 to 29
12000	50	*Chartered*	50 0 0	6 10 0	42 to 43
6000	50	Do.	40 0 0	6 10 0	33 to 33½
10000	20	*City of London*, A shares	20 0 0	9 0 0	22 to 23
10000	10	Do., B shares	10 0 0	4 0 0	6½ to 7
9629	10	Do., new shares.	10 0 0	9 0 0	11 to 12
25000	25	City of Moscow (L)	25 0 0		8¼ to 9¼
17490	25	*Commercial* . . .	25 0 0	10 0 0	32 to 33
20000	20	Continental Union.	20 0 0	4 0 0	13 to 14
10000	20	Do., preference .	20 0 0	7 0 0	
5827	5	County & General (Limited) . .	5 0 0	nil.	
2000	5	Do., preference . (Pater, Pembroke, Ely, Lea Bridge, Northfleet, Walton, & Ware.)	5 0 0	nil.	
		Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)			
20000	10	*Gt. Cent. Gaz Cons.*	10 0 0	10 0 0	12¼ to 12½
5000	10	Hong Kong (Lim.)	10 0 0	5 0 0	8 to 10
26000	50	*Imperial*	50 0 0	10 0 0	61 to 62
1300	100	Do., bonds . . .	£100	10 0 0	170 to 175
2391	25	Imperial Austrian.	25 0 0	nil.	
28000	50	*Impl. Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwp., Bordeaux, Brussels, Cologne, Frankfort-on-M., Haarlem, Stolberg, Toulouse, & Vienna	43 15 0	16 0 0	94 to 95
400	100	Impl. Mexican (L.)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent* . . .	40 0 0	10 0 0	50 to 53
3000	10	Do.	10 0 0	5 0 0	7 to 9
3000	20	Do.	12 10 0	7 10 0	13 to 14
7133	50	*London*	50 0 0	10 0 0	62 to 63
5610	25	Do., 1st pref. .	25 0 0	6 0 0	25 to 26
503	50	Do., 2nd pref. .	50 0 0	6 0 0	
214	50	Do., 3rd pref. .	50 0 0	6 0 0	
18781		Do., 1st pref. sk		6 0 0	
11828		Do., 2nd pref. sk		5 0 0	
12000	5	Malta & Medit. (L.)	5 0 0	4 0 0	3¼ to 4
6000	5	Do., preference .	5 0 0	7 0 0	5 0 0
30000	5	Oriental, Calcutta	5 0 0	9 0 0	6½ to 6¾
30000	5	Do., new shares.	1 0 0	9 0 0	1¼ to 1⅜
10090	5	Ottoman (Limited)	5 0 0	nil.	1⅜ to 2½
10000	10	Pará (Limited) . .	10 0 0	6 0 0	8½ to 9
27000	20	*Phœnix*	20 0 0	10 0 0	25 to 26
3600	100	Do., new	35 0 0	7 10 0	35 to 36
114000	Sk.	Do.	100 0 0	5 0 0	70 to 72
5000	20	*Ratcliff*	20 0 0	10 0 0	22 to 24
	20	Rio de Janeiro (L.)	20 0 0	10 0 0	22 to 23
6959	5	Singapore (Lim.) .	5 0 0	3 0 0	
2000	5	Do., preference .	5 0 0	7 10 0	
		Shanghai			
4800	50	*Sth. Metropolitan*	50 0 0	10 0 0	70 to 71
15000	10	*Surrey Consumers*	10 0 0	9 0 0	12 to 12½
10000	10	Do., new	6 0 0	9 0 0	6 to 6½
9000	4	United General . . (Limerick)	4 0 0		2 to 2½
10000	10	*Victoria Docks.* .	5 0 0	6 0 0	
1500	10	*Wandsw. & Putn.*	10 0 0	10 0 0	10 0 0
2989	10	Do.	10 0 0	7 10 0	
316	10	Do.	6 10 0	7 10 0	
1128	10	Do.	3 0 0	7 10 0	
20000	10	Western (L.) Ash.	10 0 0	10 0 0	14 to 14¼
10000	10	Do., B shares.	5 0 0	10 0 0	7½ to 8
10000	10	Do., C shares.	5 0 0	10 0 0	6½ to 7
20000	10	Do., D shares.	1 0 0	10 0 0	1¼ to 2
8000	5	*West Ham*	5 0 0	7 10 0	6 10 0
6000	5	Do., new shares.	3 0 0	7 10 0	3 18 0
551	10	W. Lon. Junc. (L.)	10 0 0	6 0 0	
520	10	Do., preference .	10 0 0	6 0 0	

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1½ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	3 12 6	2 12 6	2 6 6	3 5 0	3 5 0
1½ and 2-inch Socket-pipes	7 10 0	9 0 0	6 15 0	8 15 0	7 10 0
2½ and 3-inch ditto	7 0 0	6 0 0	6 5 0	6 10 0	7 0 0
4 and 5-inch ditto	6 10 0	5 10 0	5 15 0	6 0 0	6 10 0
6 inches and upwards ditto	6 5 0	5 0 0	5 10 0	5 15 0	6 5 0
Retorts, 1st fusion, hot blast	6 0 0	—	5 5 0	5 10 0	6 0 0
Ditto, 2nd ditto, cold ditto	7 0 0	5 15 0	5 15 0	6 0 0	7 0 0
Tank-plates, ¼ thick and above	6 10 0	5 10 0	5 10 0	5 15 0	6 5 0

WROUGHT-IRON TUBING,

Subject to 50 per cent. Discount.

	2 in.	1¼ in.	1½ in.	1 in.	¾ in	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 feet—per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ditto, from 6 inches to 18 inches—each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows (wrought iron)	3 9	2 3	1 9	1 6	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, ditto	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	25 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 3-quart	15 0	14 0	13 6	13 0	12 0	—

GAS COALS.—*Per Ton.*

Newcastle.—Unscreened:—

East Castle, Haswells, Nettlesworth Primrose, and South Pelaw . . . . 7s. 6d.

Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose 7 9

Burnhope, Craghead, Charlaw, Derwent, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton and Witton 8 0

Peareth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton 8 3

Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson 8 6

Ramsay's Newcastle Cannel 15 0

Wigan Cannel (at Liverpool) 17 0

Scotch Cannel:—

Boghead (at Leith) 42 6

Muirkirk 27 0

Kirkness, best (at Burntisland) 28 6

Capeldrae, 1st quality (at ditto) 28 6

Ditto, 2nd ditto (at ditto) 18 6

Cowdenbeath 12 0

Losmahago (at Glasgow) 31 6

Ditto (at Granton) 32 6

Arniston 27 6

Wemyss 27 6

Haywood, Wilsontown (at Granton) 23 0

Pirnie, or Methill 17 0

Lothian's Cannel (at Leith) 28 0

Myles' Cannel 23 6

Lochore Parrot (at Burntisland) 28 0

Lanemark (at Glasgow) 16 0

FREIGHTS.

Constwise—Newcastle.—Per Ton:—

Chatham and Rochester . . . . 6s. 3d. to 6 0

Cork . . . . 9s. to 9 6

Dover, Folkestne, & Ramsgate 7 0

Dublin . . . . 9s. 6d. to 10 0

Exeter Quay 8 6

Ipswich 6 6

London (from Leith) 9 0

London (Pool) . . . . 6s. to 6 3

Lowestoft and Yarmouth . . . . 5s. 3d. to 5 6

Portsmouth & Southampton 8 0

Plymouth 7 6

Shoreham 7 6

Whitstable 7 0

Weymouth 8 0

Foreign.—Per Keel:—

Barcelona £18 5

Bordeaux 14 0

Boulogne and Calais 7 10

Cadiz 12 0

Cronstadt . . . . —

Copenhagen 11 10

Genoa 18 0

Hamburg 11 0

Havre de Grace 8 10

Leghorn 17 0

Lisbon 12 0

Rotterdam 11 0

Stettin 9 10

Trieste 12 0

Venice 16 0

SUNDRIES.

Best Natle. Fire-bks., p. 1000, £2 10s. to £2 15 0

Cliff's Fire-bks. (at Wortley), p. 1000. 2 15 0

Ingham's ditto (at Wortley), p. 1000, . 2 15 6

Fire-clay Retorts, p. ft. run, 5s. 6d. to 6 7 0

Tough Cake Copper, p. ton 73 10 0

English Pig Lead, p. ton 19 0 0

Welsh Bar Iron (in London), p. ton . . 6 10 0

Foreign Spelter, p. ton 20 5 0

English Block Tin, p. ton 96 0 0

Banca, p. ton 90 0 0

Tarred Rope Yarn, p. cwt. 1 0 0

WANTED, by the Advertiser, a situation as CLERK, either in a Gas or Water Company's Office. Salary not the primary object. Has had seven years experience. Satisfactory references.

Address W. A., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a situation as MANAGER of Gas-Works, where the annual make of gas is from 10,000,000 to 15,000,000 cubic feet. Is a practical gas engineer, with first-class experience in every department of gas manufacture and distribution; also in the manufacture of the residuary products.

Testimonials from and references to past and present employers.

Address G. M., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO FOREIGN GAS COMPANIES.

CLERK—a Gentleman, who has been several years in the Office of a Gas Company, desires a situation abroad. Good knowledge of French.

Address F. B. M., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES.

A Gentleman, of 17 years practical experience in the management and erection of Works, is open to an engagement as Manager or Secretary and Manager, at a salary dependent upon net profit realized. First-class testimonials and references. Security to £1000 if required.

Address C. T., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES, ENGINEERS, &c.

TO BE SOLD, by the Wandsworth and Putney Gaslight and Coke Company, a TELESCOPE GASHOLDER—Inner Lift, 46 ft. 4 in. diameter by 16 ft. deep; Outer Lift, 47 ft. 10 in. diameter by 16 ft. deep, together with the columns and girders complete.

Also several 6 in., 7 in., and 8 in. DONKIN'S VALVES, nearly new.

Also several small GASHOLDER COLUMNS, and a lot of useful connexions.

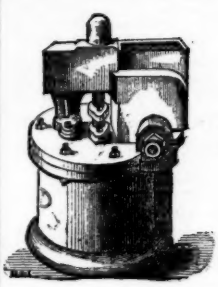
The above are in good condition, and to be sold in consequence of larger having been substituted.

For further particulars, and to view, apply to the Company's Engineer, Mr. H. E. JONES, at the Gas-Works, WANDSWORTH.

By order,
Jan. 30, 1868. ALFRED LASS, Secretary.

THE LONDON & WESTMINSTER METER COMPANY, LIMITED.

PATENTEES AND SOLE MANUFACTURERS OF



THE ABC GAS-METER.

EDGE'S PATENT INDEX.

MYERS'S PATENT WATER-METER.

(A CYLINDER & PISTON.)

The ABC GAS-METER shows in plain figures the money payable for Gas consumed, as well as the number of cubic feet.

MYERS'S WATER-METER is accurate in measurement, simple in action, and moderate in price.

Manufacturers of the ordinary Wet and Dry Meters, Governors, Photometers, and all other Gas and Water Apparatus.

JOHNSON'S PLACE, LUPUS STREET, LONDON, S.W.

JOHN VICKARY,

GAS ENGINEER AND CONTRACTOR, IRON AND BRASS FOUNDER,

WORKS—EXE ISLAND, EXETER,

Tenders his best thanks to the various Gas Companies in **England, Ireland, and Wales,** for the very liberal and kind support he has received for the last **22 years,** during which period he has erected and extended above **200 Gas-Works.**

In addition to the numerous towns wherein he has been engaged, he begs reference to the following testimonial:—

Plymouth and Stonehouse Gaslight and Coke Company.

Sir,—I have much pleasure in testifying that the 100-foot Telescope Gasholder and Cast-Iron Tank, erected by you for this Company in 1862, has given the highest satisfaction, and never required the slightest attention or adjustment since its completion.

(Signed) PETER ADAMS, Chairman.

He has also erected a 100-foot Gasholder and Cast-Iron Tank at **Exeter;** an 80-foot Telescope Gasholder and Iron Tank at **Devonport;** a 90-foot at **Torquay,** &c. &c. At either of those works satisfactory references can be made.

He also begs particular attention to his **Improved Gas-Meters,** either **Wet, Dry, or Compensating,** the materials and workmanship of which guaranteed of the very best description, and which has gained for his Meters so excellent a reputation for these last **20 years.**

RETORTS, DIP & ASCENSION PIPES, HYDRAULIC MAIN, CONDENSERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, and GASHOLDERS,

Of any size, and every description of article required in Gas-Works.

Mains, Tees, Connexions, and Syphons, from 2 to 12 in., always in stock, and supplied at Scotch prices.
Clay Retorts and Fire-Goods of every description.
Gas-Fittings of the most modern designs.
Iron Pipe and Fittings, Service Cocks, &c.
Plans, Specifications, and Estimate for the erection of New Gas-Works of any size furnished.

THE ONLY COMPLETE CAST-IRON CASED DRY GAS-METER,

PATENTED MARCH 31, 1865.

Gas Engineers and others will find that the above Meter is made of the most durable material, also that it can be repaired at a fraction of the cost of any other Meter now manufactured; all the interior fittings, as well as the case, being fitted together with screws.

Drawings explanatory of the above on application.

SOLE MANUFACTURERS:

FULLERTON, SON, & CO., ABBEY MOUNT WORKS, EDINBURGH.

Station-Meters and Gas Apparatus, Consumers Wet Gas-Meters in Cast-Iron, and Dry in Tin Plate Cases.

WANTED, an Assistant thoroughly skilled in preparing drawings for a Gas-Work, and matters in connexion with the same.

Address, stating terms, to H. G. H., 10, OLD JEWRY CHAMBERS, E.C.

WANTED, by a young Man, a situation as GENERAL MANAGER in a provincial Gas-Work. Perfectly understands the manufacture and distribution of Gas, main and service laying, gas-fitting, can keep accounts by double entry, and collect. First-rate testimonials.

Apply to A. S., 77, Grosvenor Mews, New Bond Street, LONDON.

WANTED, a re-engagement as MANAGER of a small Work, or employment as Fitter, Meter Inspector, Main and Service Layer, or in erection of Works. Over 20 years experience. Good references.

Apply E. G., 2, John Street, East Street, WALWORTH, S.

LAMP-POSTS—Plain & Ornamental.
DWARF GAS-PILLARS—Do., do.
LAMP-BRACKETS—Do., do.
LAMPS, in Copper, Tin, and Iron—Do., do.
NUMBERS for STREET-LAMPS.
FOUNTAINS—Garden and Drinking.

The newest DESIGNS for these will be forwarded, *upon receipt of particulars*, by

TURNER AND ALLEN,
Founders & Contractors,
201, UPPER THAMES STREET, LONDON.

IMPORTANT TO GAS & WATER COMPANIES, GAS ENGINEERS, IRONFOUNDERS, &c.

PRESERVATION of Gas and Water PIPES, TUBES, &c.

The DE LAVENANT PATENT PROCESS for the PRESERVATION and ORNAMENTATION of IRON may be seen, and every information obtained, at the Offices of the Agents,

Messrs. TURNER & ALLEN,
201, UPPER THAMES STREET, LONDON.
Prospectuses forwarded free.

WANTED, by the 2nd of June next, two second-hand dry-lime PURIFIERS, 14 ft. long, 8 or 9 ft. wide, 3½ or 4 ft. deep, with covers and sieves complete, in good condition.

Apply to the MANAGER, Gas-Works, AYR, N.B., stating price put into railway trucks, before the 13th proximo.

Ayr Gas-Works, Jan. 15, 1868.

WANTED, a re-engagement as Manager or Engineer to a Gas Company at home or abroad. Advertiser has had 16 years experience in every department. Satisfactory testimonials and references.

Address METER, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TRAVELLERS wanted on Commission, calling on Gas-Fitters, Plumbers, and the Gas trade generally.

Apply by letter, stating commission required, and other particulars, with references, to MR. CHAMBERLAIN, Fire-Arm Agent, No. 23, Birchin Lane, CITY, E.C.

FOR SALE, the undernoted Gas- METERS, the whole of which have been made since 1862, and are stamped in accordance with the requirements of the "Act for Regulating Measures used in Sales of Gas," are offered for Sale at a reduction of 50 per cent.

Made by Messrs. COWAN, EDINBURGH:—

38 5-light Meters.	}	Esson's Patent Compensating Fountain.
119 3-light do.		
24 2-light do.		
23 3-light do.		Ray's Patent.

Made by Messrs. LAIDLAW, EDINBURGH:—

41 No. 1 Meters.	}	Esson's Patent Compensating Fountain.
7 No. 2 do.		

Made by ALDER, EDINBURGH:—
25 No. 1 Meters.

The whole of the above Meters, being surplus stock of the "Perth New Gas Company," have only been in use for a short time, and are in good order.

For particulars apply to the SECRETARY of the "Perth Gaslight Company."

Perth, Jan. 17, 1868.

TO TAR DISTILLERS.

TENDERS are solicited for the purchase of present stock of TAR (about 60,000 gallons), into the purchasers casks, at the Bedford Gas-Works, which are situate within five minutes of the Midland Station.

Tenders addressed to the MANAGER, Bedford Gas-Works, Bedford, BEDFORDSHIRE, until Feb. 19, 1868.

Also Tenders for the surplus annual make at per 100 gallons, into purchasers casks, at the Gas-Works, Bedford.

Jan 30, 1868.

TO COAL TAR DISTILLERS.

THE Directors of the Leighton Buzzard Gas and Coke Company are prepared to receive TENDERS for the surplus TAR produced at their Works for one, two, or three years, from Jan. 1, 1868, the quantity being about 10,000 gallons.

Tenders to be sent to WILLIAM MELLOR, Manager.

PURIFICATION OF GAS.

FRODINGHAM IRONSTONE MINES,
NEAR
BRIGG, LINCOLNSHIRE.

Gas Companies can be supplied from these Mines with OXIDE of IRON, for the purification of Gas, on reasonable terms, and in any quantity that may be required.

This material is a natural Oxide, and is supplied to Gas Companies as taken from the Mines, without any admixture of deleterious matter. It acts freely, and will purify a much larger quantity of gas per ton, than the generality of the material now in use under this name.

It will be found highly beneficial in large establishments, where they are liable to be called upon occasionally to make a much greater quantity of gas than usual, as well as in small establishments where they are limited in space, as by its adoption a much larger quantity of gas can in much less time be purified with the same quantity of material.

Apply to Mr. JAMES SHERWOOD, at the Mines; or to Mr. LIVESEY, 6, Victoria Street, WESTMINSTER, London Agent.

TO GAS COMPANIES AND THE TRADE.

J. DEFRIES & SONS,
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS;
IMPROVED CRYSTAL STAR & SUN LIGHTS;
VESTIBULES,
IRON BARREL, COMPOSITION TUBING,
AND
GAS-FITTINGS OF EVERY DESCRIPTION.

WORKS:
LONDON, BIRMINGHAM, AND PARIS.

Special Designs prepared in perfect accordance with architectural arrangements. Estimates furnished for the Lighting and Fitting up of Theatres, Music-Halls, and Public or Private Buildings with Gas.

GAS MOONS OF THE NEWEST DESIGNS.
The Patent Gas-Regulator & Purifier reduced to 6s. 6d. per Dozen.

Pattern Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1868, are now complete.

CITY SHOW-ROOMS & MANUFACTORY,
147, HOUNDSDITCH.

JOSEPH RATCLIFF & SONS,
BRASS & IRON FOUNDERS,
Manufacturers of
BRASS GAS-FITTINGS, CHANDELIERS, &c.,
In various styles; also of
PATENT WELDED WROUGHT-IRON TUBES AND FITTINGS.

Catalogues and prices on application at the WORKS AND SHOW-ROOMS,
NEW CHURCH STREET, SUMMER LANE, BIRMINGHAM.

TO GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS.

TO be disposed of, a Valuable Patent for the manufacture of apparatus in considerable repute, and used by Gas Companies for the last three years and a half, affording a good profit, which may be greatly increased with moderate exertion. The sole reason for desiring to part with it is, that the Patentee's other engagements will not admit of his devoting the time to its extension which the merits of the invention warrant.

Apply by letter, with real name and address, to C. E., care of Mr. W. H. Bennett, Patent Agent, 42, Parliament Street, LONDON, S.W.

BROMLEY GAS CONSUMERS COMPANY.

NOTICE is hereby given that the YEARLY ORDINARY GENERAL MEETING of the SHAREHOLDERS of this Company will be held at the Bell Hotel, Bromley, Kent, on THURSDAY, the 27th inst., to receive the Report of the Directors, and Balance-sheet approved by the Auditors, to declare a Dividend, and for general business. The Chair will be taken at seven o'clock precisely.—By order,

GEORGE H. OSBORN,
Secretary & Manager.

Offices: Brick Kiln Lane, Bromley, Kent, S.E., Feb. 1, 1868.

HASLINGDEN UNION GAS COMPANY.

TO GASOMETER MAKERS.

THE Directors of this Company are open to receive TENDERS for the supply and construction, at their Works at Mill Hill, near Haslingden, of a TELESCOPE GASHOLDER, the outer or lower section of which Telescope is to be 90 ft. diameter inside measure, and 22 ft. deep, and the inner or upper section is to be 88½ ft. diameter inside measure, and 22 ft. deep, with 10 suspension columns, girders, &c.

Plans and specifications may be seen, and forms of tender obtained, upon application at the Company's Office, Mill Hill.

Sealed tenders, addressed to the CHAIRMAN of the Directors, to be forwarded under cover to me, the undersigned, on or before the 15th day of February next.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
THOMAS WOODCOCK, Secretary.
West View, Haslingden, Jan. 23, 1868.

PROPOSED GAS-WORKS
FOR THE
CITY OF BUCHAREST,
ROUMANIA.

TENDERS are requested to be sent in to the Municipality, at the Town-hall, in the city of Bucharest, not later than the 14th of March, 1868, to comprise the following works and conditions:—

1. The construction, on a site of ground to be provided by the town, of the necessary Gas-Works, plant, and equipments for a sufficient supply of gas for the city of Bucharest, including the works, materials, and details for laying down 100,000 lineal mètres of gas mains or pipes of various diameters.

2. The works to be completed within the following periods—viz., 65,000 lineal mètres of gas mains or pipes, with the gas-works and plant, to be completed within 18 months after signing the contract. The remaining 35,000 lineal mètres to be completed within five years after the same period.

3. The Contractor or Concessionaire will also be re-required to execute whenever called upon during the first five years by the town authorities, and at their expense, any further extent of gas-mains beyond what is mentioned in Article 1; but the limit of such supplementary works may be stated in the tender.

4. The Municipality of Bucharest will require 4000 public lights for the streets of the town during the first five years. The standards, brackets, lanterns, and other details for such public lamps to be furnished at the expense of the contractor.

5. The tenders must set forth the prices per cubic mètre to be charged for the gas to be supplied both to the Municipality and to private consumers, also the conditions of the supplementary gas-mains above mentioned, and the area of land required for the construction of the works. The tenders to be sealed and accompanied by a deposit of 50,000f. cash, or of property securities to double this amount.

6. The concession for the supply of gas to be for 40 years, at the expiration of which term the whole of the Gas-Works, mains, and other works to become the property of the town, with or without compensation to the Contractor, as may be set forth in the tender.

For further particulars, and for a copy of the specification or conditions of the concession, application may be made at the Town-hall, Bucharest. Copies of the conditions may also be obtained after the 30th of December, at the Librairie du Luxembourg, 16, Rue Tournon, Paris.

For the Mayor, C. LAPATY.
The Sec.-Gen., T. J. FORSHENEANO.
Bucharest, Dec., 1867.

THE Broughton Coal Company, near Wrexham, have about 1000 tons of CANNEL COAL to dispose of.

Apply at the BROUGHTON COLLIERIES, near WREXHAM.

THE
BRITISH IRON TUBE COMPANY,
MANUFACTURERS OF
PATENT WELDED WROUGHT-IRON TUBES & FITTINGS,
For Gas, Steam, and Water;
SCREWING TACKLE, CORE BARS,
Hydraulic and other Tubes and Coils, to order.

WORKS, WAREHOUSE, & OFFICES:
28, CHARLOTTE STREET, BIRMINGHAM.
AGENTS IN LONDON:
D. W. OGG AND CO., 3, JEFFREY'S SQUARE, ST. MARY AXE.

D. W. OGG and CO. have lately engaged to represent one of the largest shippers of Scotch Cannels at prices that cannot fail to command the attention of Gas Companies at a period like the present, when quality of gas seems so desirable.

Offices, 3, Jeffrey's Square, St. Mary Axe, LONDON.

IMPROVED GAS-ENGINES.

KINDER AND KINSEY'S PATENT.

THE GAS-ENGINE COMPANY, LIMITED,

Having secured the above Patent, which embodies considerable and important improvements upon the Lenoir Engine, are now prepared to execute orders for Engines of one, two, and three horse power made in accordance therewith.

These Engines are worked with a very small quantity of water. They can be fixed for a nominal sum, and their working power will be guaranteed for twelve months.

The inspection of intending purchasers is solicited at the Company's Factory, 4, Vine Street, York Road, Lambeth, S., and the severest test invited before ordering any Engine.

PRICES:

One-Horse Power, £85; Two-Horse Power, £110; Three-Horse Power, £135.

DELIVERED FREE TO ANY RAILWAY STATION IN ENGLAND OR SCOTLAND.

Further particulars on application to the SECRETARY, 92, CANNON STREET, LONDON.

ORLANDO BROTHERS'

SELF-ACTING DISTRICT GOVERNOR.

Prices, according to size, can be obtained upon application to

Mr. WILLIAM ARCHER,

METER COMPANY'S WORKS, OLDHAM.

ECONOMY IN GAS PURIFICATION.

Mc DOUGALL'S

HYDRATED PEROXIDE OF IRON.

This Oxide is now well known, and has gained at a number of the largest gas-works at home and abroad a decided preference for efficiency and durability. It is free from any mixture of sawdust or other material, every particle being available for use, thus causing the Purifiers to work double the time before it requires renewing, and saves one-third the cost of labour in charging them. It readily takes up sulphur, revivifies rapidly, and lasts longer than any other Oxide in the market. Prices on application to—

Mc DOUGALL BROTHERS, Manufacturing Chemists,

LONDON—11, Arthur Street West, London Bridge, E.C.; MANCHESTER—Riga Street, Shudehill.

SILVER MEDAL, INTERNATIONAL EXHIBITION, PARIS, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES & FITTINGS,

PLAIN, GALVANIZED, & ENAMELLED, for Gas, Steam, and Water, from ⅛ in. to 6 in. bore.

STOCKS, TAPS, and DIES, GUN METAL GLAND-COCKS, WATER-GAUGES, &c.

PATENT LAP-WELDED IRON TUBES

For Locomotive and Marine Boilers, &c.

LONDON WAREHOUSE—No 66, QUEEN STREET, E.C.

LIVERPOOL: No. 4, Cooper's Row, and Bold's Yard, Strand Street.

MANCHESTER: Barlow's Croft, Chapel Street, Salford.

LIVESEY FIRE-CLAY WORKS,

NEAR BLACKBURN, LANCASHIRE.

ORLANDO BROTHERS,

MANUFACTURER OF PATENT CLAY RETORTS,

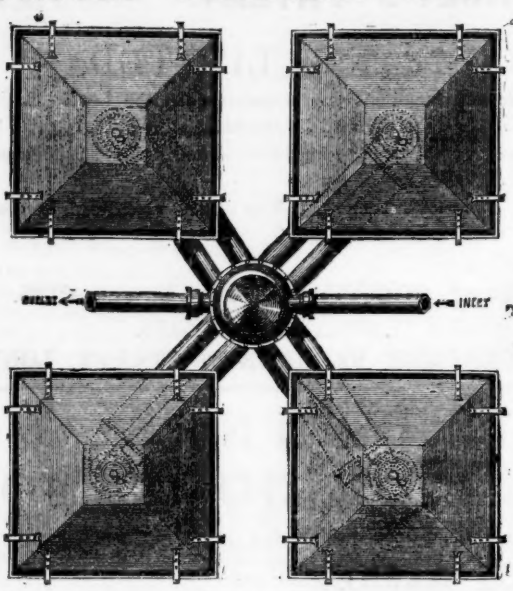
AND EVERY DESCRIPTION OF

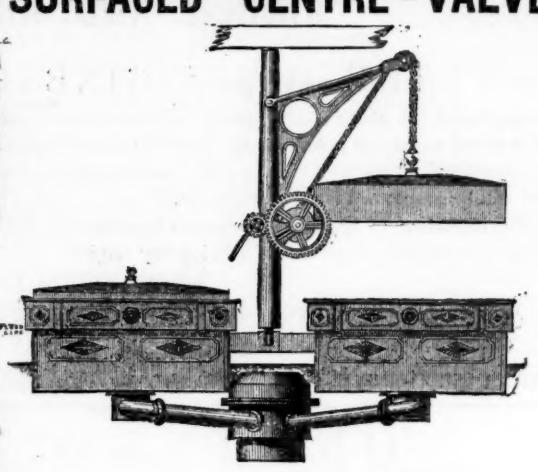
TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS.

WALKERS'

IMPROVED PURIFIERS AND SURFACED CENTRE-VALVES.





C. & W. WALKER

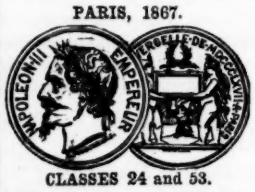
Are constructing these Purifiers with their simple straight connexions of all dimensions, from 30 feet square down to 4 feet square, the patterns of which are in constant use in their foundry.

When the Purifiers are fixed in square the covers are lifted and travelled by the centre crane shown. When fixed in line, by a travelling crane on trellis girders.

Their Centre-Valves with their patented improvements have this *very great advantage over all other Centre-Valves*—they are *entirely shut in* and *protected by the casing*, all *danger of explosions* or the passage of foul gas being completely abolished. The *working of the Valve is so easy, and is so governed* that it can be safely **worked in the dark**. Directly the Valve has turned the required distance its motion is *instantaneously stopped*. The largest Centre-Valves in England which have been made by Messrs. Walker can be easily turned by one man with one hand. *See Clegg's "Treatise on Coal Gas," pages* 206–7.

MIDLAND WORKS, DONNINGTON, NEWPORT, SHROPSHIRE.

PARIS, 1867.



CLASSES 24 and 53.

WILLIAM SUGG,

GAS ENGINEER.

LONDON, 1862.

CLASSES 13 and 31.

PUBLIC LAMP GOVERNORS, LEVER COCKS, AND POLE LIGHTERS,

LAMP METERS AND BOXES.

The Catalogue and Lists of Prices for all the New Instruments and Apparatus of his Manufacture are now ready, and may be had on application, per post or otherwise, at

VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

EDWARD COCKEY & SONS,

IRON-WORKS, FROME SELWOOD,

PATENT GAS-VALVES.

A PRIZE MEDAL

WAS AWARDED TO THE PATENTEES AT THE INTERNATIONAL EXHIBITION OF 1862.

These Valves are formed of two cylinders, working one on the other horizontally, having their faces ground perfectly gas-tight.

They are adapted either as central valves, for two, three, or four purifiers—as bye-passes—or as inlet and outlet-valves for gasholders.

They have been fixed in some of the most important Gas-Works in the Kingdom, for more than eight years. Considerably over two hundred of them are now in use, and the most satisfactory reports of their advantages continue to be received. They are simple in construction, and not liable to get out of repair, and if in course of time the faces should leak, they can be easily re-ground and made as tight as ever, without removal from their positions. Each Valve is fitted with an index, which shows to the person in charge of the Works in what direction the gas is passing.

Frome, January 20, 1866.

D. GRANT & CO.,
GAS-METER MANUFACTURERS.

STATION-METERS ANY SIZE.
PHOTOMETERS, EXPERIMENTAL METERS,
PRESSURE-GAUGES, &c.
Price List on application.
GAS-METER WORKS, CROSSCAUSEWAY, EDINBURGH.

HARRIS and PEARSON,
PROPRIETORS OF
BEST CLASS-HOUSE POT AND CRUCIBLE CLAY
MANUFACTURERS OF
FIRE BRICKS, GAS RETORTS, &C
AMBLECOTE FIRE CLAY AND BRICK WORKS,
STOURBRIDGE.
Late in the occupation of I. and W. King. Originally J. Pidcock, Esq.
NB A quantity of best Clay Retorts in stock, viz.—Circulars, 14 inches, 15 inches. 16 inches.
D's, 16×12, 15×14, 20×16, 16×18.

INTERNATIONAL EXHIBITION,
1862. CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS,
&c. &c.
SCOTSWOOD FIRE-BRICK WORKS,
NEAR
BLAYDON-ON-TYNE.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

WOOD SIEVES for GAS PURIFIERS.
THE BEST AND CHEAPEST
CAN BE PURCHASED FROM
T. COULTHARD, WEST STRAND, PRESTON,
LANCASHIRE.

HANCOCK'S INDIA-RUBBER GAS-TUBING.
All sizes, from ⅛ in. to 4 in. diameter and upwards.
Also,
HORSE SINGEING APPARATUS, best make, with GAS-BURNERS, COMBS, and INDIA-RUBBER TUBING, all complete.
INDIA-RUBBER BAGS for GAS-MAINS.
WASHERS for GAS and STEAM JOINTS.
VALVES (pure solid Rubber) for STEAM-ENGINES.
PACKING (Elastic) for STEAM-ENGINES.
FLANGE TUBING, for excluding Draughts and Dust through WINDOWS, DOORS, and GLASS CASES.

Section.

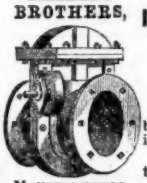
Illustrated Price Lists on application.
JAMES LYNE HANCOCK,
Vulcanized India-Rubber Works,
GOSWELL MEWS, AND 266, GOSWELL ROAD
LONDON, E.C.

B. CARPENTER'S
IMPROVED
WOOD SIEVES FOR GAS PURIFIERS.
WORKS:
14, JOHN STREET, PENTONVILLE ROAD,
LONDON, N.

The above Sieves are used by the principal Gas Companies in London and the country. Their utility, durability, and cheapness combined, render them superior to all others.
Testimonials from Gas Engineers who have tested their qualities forwarded on application.
All orders punctually attended to, and estimates given if required.

Trade Mark. **THE MEDAL FOR 1862.**
THE ONLY PRIZE MEDAL AWARDED FOR TUBES AND FITTINGS.
CROWN TUBE-WORKS,
WEDNESBURY STAFFORDSHIRE.
WAREHOUSE—81, UPPER GROUND ST., LONDON.
JAMES RUSSELL & SONS,
Patentees and First Makers of Wrought-Iron Tubes.

LAMBERT BROTHERS,



MANUFACTURERS,
WALSALL.

REDUCED PRICES OF
IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS.
2, 2½, and 3 in.... 12s. per in.
4 in. to 6 in..... 11s. „
7 in. to 12 in..... 10s. „
These Valves are all proved on both sides to 30 lb. on the square inch before leaving the works.
Valves made with outside racks to order.
Also Water-Valves, with gun-metal faces and gun-metal screws.

JAMES M'KELVIE,
CANNEL COAL MERCHANT,
HAYMARKET,
EDINBURGH.
Established 1840.

WALTER MABON & CO.,
Engineers,
ARDWICK IRON-WORKS,
FAIRFIELD STREET, MANCHESTER,
MANUFACTURERS OF
IRON TANKS, GASHOLDERS,
GAS APPARATUS,
PIPES, VALVES, IRON ROOFS,
WROUGHT AND CAST-IRON GIRDER
DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.

GAS & WATER PIPES,
GIRDERS, COLUMNS, RETORTS, AND GENERAL CASTINGS,
quoted for on application to
GEO. BOWER,
MILTON IRON-WORKS,
WEST HARTLEPOOL.
N.B.—A large stock of 2 to 8 in. pipes usually ready for immediate delivery.

D. BRUCE PEEBLES,
Gas-Meter Manufacturer,
FOUNTAINBRIDGE
EDINBURGH.

THOMAS EDINGTON & SONS,
PHŒNIX IRON-WORKS,
GLASGOW,
Manufacturers of all kinds of
GAS AND WATER PIPES,
Branches, Bends, Water-Traps, Tank-Plates, Valves, and general Castings. Also
RAILWAY CHAIRS & SLEEPERS,
AND
GRIFFIN'S PATENT PERMANENT WAY.
London Office, 63, Old Broad Street.

STEARS BROTHERS & CO.,
Gas Engineers and Contractors,
3, GEORGE STREET, HULL,
AND
73, COLEMAN STREET, LONDON, E.C.
Contractors for Gas-Works of any size at home or abroad. Copy of testimonials from numerous Gas Companies can be had on application.

STOURBRIDGE FIRE-CLAY WORKS.
E. BAKER & CO.,
24 WHARF, HARROW ROAD, PADDINGTON, W.
FIRE-BRICKS, LUMPS, SQUARES, and TILES of all dimensions.
GAS-RETORTS always in stock.
GARDEN EDGINGS of various patterns.
ORNAMENTAL BUILDING BRICKS.
GRATE BACKS in various designs.
Contracts entered into to set Retorts, erect Furnaces, &c.
Shipments on the shortest notice.

W. J. HOLLANDS,
IRON MERCHANT,
81, BANKSIDE, LONDON, S.E.
SOCKET, FLANGE, HOT-WATER PIPES, AND ALL CONNEXIONS; RETORTS, HYDRAULIC MAIN, LAMP-COLUMNS, &c.; AND EVERY DESCRIPTION OF CASTINGS AND WROUGHT-IRON-WORK FOR GAS AND WATER-WORKS, STEAM, AND GENERAL PURPOSES.
N.B.—All goods kept in stock, and supplied at wholesale prices. Estimates given, and orders by post punctually attended to the same day.

JAMES OAKES and CO.,
ALFRETON IRON WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20, WHARF ROAD,
CITY ROAD, LONDON,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water-Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.
N.B.—Orders for Cast-iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention.
CHARLES HORSLEY, Agent.

ROBERT MACLAREN and CO.,
EGLINTON FOUNDRY, GLASGOW,
Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.
Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
Warehouse in London for Cast-iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
Office in London, Mr. E. M. PERKINS, 78, Lombard Street.

FRASER'S PATENT RIBBED RETORTS.
THESE Retorts have been introduced at a large number of Gas-Works. The great durability of the Ribbed Iron Retort specially recommends it for works where an exhauster is not used. The Clay Ovens and Retorts are so constructed as to favour the more speedy and effectual carbonization of the Coal, whilst the deposition of Carbon does not so readily take place as in the ordinary Retorts.
Illustrated circulars with prices delivered will be furnished on application to ALEX. C. FRASER, Gas-Works, COLCHESTER.

BELGIAN CLAY RETORTS.
J. SUGG and CO., late ALBERT KELLER, Ghent.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications, addressed to J. SUGG and CO., GHENT, will receive immediate attention.

TO INVENTORS AND PATENTEES.
MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the advertiser, 42, Parliament Street, WESTMINSTER. [Office of the JOURNAL OF GAS LIGHTING, &c.]

MR. G. W. STEVENSON, C.E., F.G.S., (for the last 10 years Engineer to the Corporation of Halifax), may be consulted upon all matters connected with the construction of gas-works, and the manufacture and supply of gas; also upon the construction of water-works and the supply of water to towns; and also in respect to the sewerage of towns, and sanitary works generally.
OFFICE: 14, Park Street, WESTMINSTER.

ALFRED PENNY, Gas and
CONSULTING ENGINEER,
WENLOCK IRON WORKS,
21, WHARF ROAD, CITY ROAD, LONDON.
Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.
Plans, Specifications, and Estimates prepared.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire-Bricks, and every description of Fire-Clay Goods.

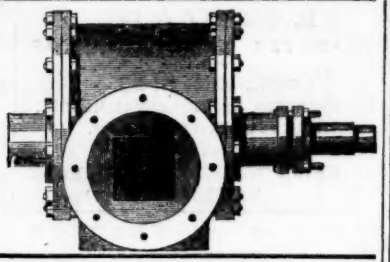
ROTATORY AND DOUBLE-ACTING GAS-EXHAUSTERS,

with many recent improvements, from 1500 to 150,000 cubic feet per Hour.

JAMES BURTON, SONS, & WALLER,

MAKERS OF ENGINES, MACHINERY, and IRONWORK for GAS-WORKS,
efficient and durable TAR, LIQUOR, and SYPHON PUMPS,
GAS-VALVES, with or without Wedges, worked with powerful Worm and Rack,
SELF-ACTING BY-PASS VALVES, with Lid and Relieving Lever,
ROTATORY, TUMBLER, and CAPILLARY WATER DISTRIBUTORS for SCRUBBERS.
SMALL-SIZE EXHAUSTERS KEPT IN STOCK.

JOHN'S PLACE, HOLLAND STREET, SOUTHWARK, LONDON, S.E.



KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.

KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Bars, Flues, and Quarries, are all Manufactured of the same quality of Clay.
Every Retort and Brick is branded "King Brothers, Stourbridge."

WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of
RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY
beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.
The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO. Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

THE GAS-METER COMPANY

(LIMITED), LONDON,

(Successors to CROLL, RAIT, and CO., LONDON, and WEST and GREGSON, OLDHAM.)

MANUFACTURE

STATION-METERS & GOVERNORS

At their Oldham Establishment, which has long possessed the reputation of supplying this description of apparatus of the most perfect construction and appropriate design.

CONSUMERS GAS-METERS IN CAST-IRON & TINNED SHEET-IRON CASES.

STREET GOVERNORS, PRESSURE and EXHAUST REGISTERS, TEST GASHOLDERS,

AND EXPERIMENTAL GAS APPARATUS GENERALLY.

For information, &c., apply to

W. ARCHER, Manager, Meter Factory, OLDHAM;

OR TO

GEORGE RAIT, Managing Director, KINGSLAND ROAD, LONDON.

E. J. & J. PEARSON,

DELPH & TINTAM ABBEY FIRE-CLAY & BRICK-WORKS,

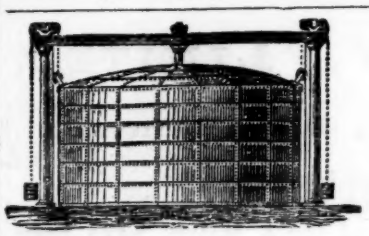
STOURBRIDGE,

PROPRIETORS OF

BEST GLASS-HOUSE POT & CRUCIBLE CLAY;

MANUFACTURERS OF

GLASS-HOUSE POTS, CRUCIBLES, GAS-RETORTS, & FIRE-BRICKS OF EVERY DESCRIPTION.



IMPROVED GAS APPARATUS,

FOR TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD.

WILL BE SENT ON APPLICATION:—

PLANS, SPECIFICATIONS, and PRICES of GAS APPARATUS;

PLANS, SPECIFICATIONS, and ESTIMATES of the requisite BUILDINGS for each size of Apparatus;

PLANS of the IMPROVED ANNULAR CONDENSERS;

PLANS of the COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.

LONDON OFFICES—56, GRACECHURCH STREET, CITY.

*** *Please address letters to the London Offices.*

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS.

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and SALT-GLAZED DRAIN-PIPES.

LONDON AGENT:

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